



**SPICER®**  
*Off-Highway Products*

# Service Manual

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Axle 223

ASM-0029E  
September 2015



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## INTRODUCTION

The efficiency and continued operation of mechanical units depend on constant, correct maintenance and also on efficient repair work, should there be a break-down or malfunction. The instructions contained in this manual have been based on a complete overhaul of the unit. However, it is up to the mechanic to decide whether or not it is necessary to assemble only individual components, when partial repair work is needed. The manual provides a quick and sure guide which, with the use of photographs and diagrams illustrating the various phases of the operations, allows accurate work to be performed. All the information needed for correct disassembly, checks and assembly of each individual component is set out below. In order to remove the differential unit from the vehicle, the manuals provided by the vehicle manufacturer should be consulted. In describing the following operations it is presumed that the unit has already been removed from the vehicle.

**IMPORTANT:** In order to facilitate work and protect both working surfaces and operators, it is advisable to use proper equipment such as: trestles or supporting benches, plastic or copper hammers, appropriate levers, pullers and specific spanners or wrenches. Before going on to disassemble the parts and drain the oil, it is best to thoroughly clean the unit, removing any encrusted or accumulated grease.

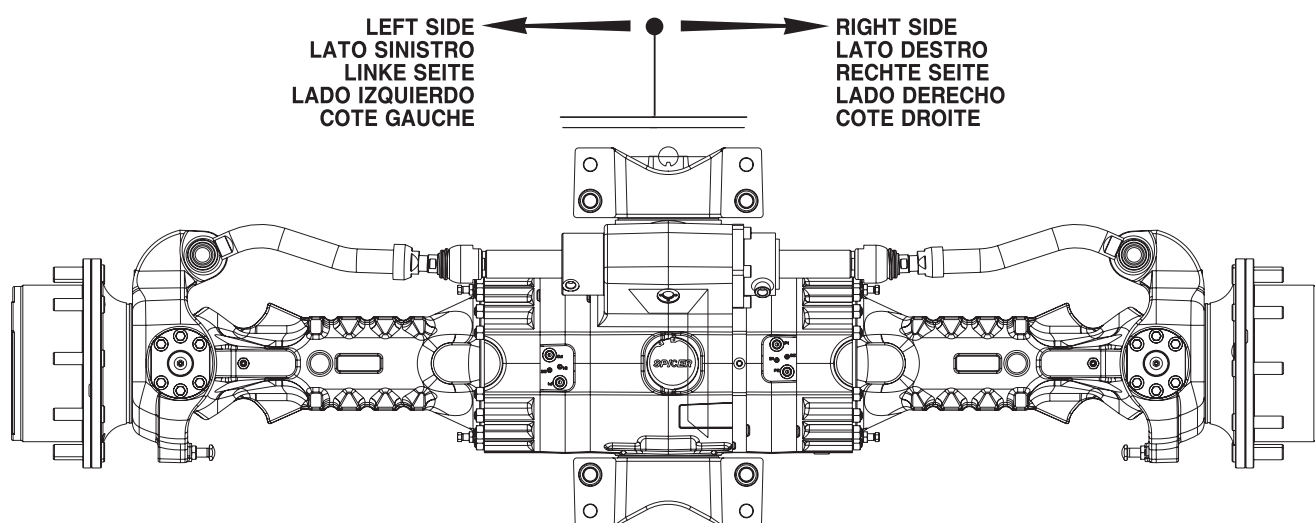
**INTRODUCTORY REMARKS:** All the disassembled mechanical units should be thoroughly cleaned with appropriate products and restored or replaced if damage, wear, cracking or seizing have occurred. In particular, thoroughly check the condition of all moving parts (bearings, gears, crown wheel and pinion, shafts) and sealing parts (o-rings, oil shields) which are subject to major stress and wear. In any case, it is advisable to replace the seals every time a component is overhauled or repaired. During assembly, the sealing rings must be lubricated on the sealing edge. In the case of the crown wheel and pinion, replacement of one component requires the replacement of the other one. During assembly, the prescribed pre-loading, backlash and torque of parts must be maintained.

**SPECIFIC EQUIPMENT AND SPARE PARTS:** The drawings of all specific tools required for maintenance and repair work can be found at the end of this manual ; spare parts may be ordered either from the vehicle manufacturer or directly from the Service Centers or Authorized Distributors of SPICER.

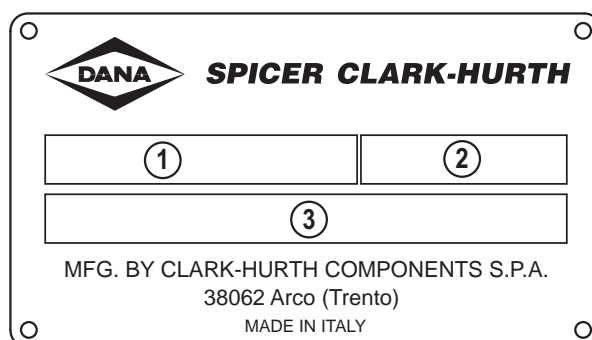


## SPECIFICATIONS

### DEFINITION OF VIEWPOINTS



### DATA PLATE



- 1 - Type and model unit - modification index
- 2 - Serial number
- 3 - Lubricant

# CONVERSION TABLES

## CONVERSION TABLES

### UNITS OF PRESSURE

	Atm	Bar	MPa	Pa	PSI
Atm	1	1	0,1	$10^5$	14,4
Bar	1	1	0,1	$10^5$	14,4
MPa	10	10	1	$10^6$	144
Pa	0,00001	0,00001	$10^{-6}$	1	-
PSI	-	-	-	-	1

### UNIT OF WEIGHT

	N	daN	kN	kg	lbs
1N	1	0,1	0,001	0,102	0,225
1daN	10	1	0,01	1,02	2,25
1kN	1000	100	1	102	225
1kg	9,81	0,981	0,00981	1	2,205

### UNITS OF TORQUE

	N·m	daN·m	kN·m	kg·m	lb·in
1N·m	1	0,1	0,001	0,102	8,854
1daN·m	10	1	0,01	1,02	88,54
1kN·m	1000	100	1	102	8854
1kg·m	9,81	0,981	0,00981	1	86,8
1 lb·in	0,1129	0,01129	0,0001129	0,01152	1

# TORQUE SPECIFICATIONS

## TORQUE SPECIFICATIONS

### COARSE PITCH

SIZE OF BOLT	TYPE OF BOLT					
	8.8	8.8 + Loctite 270	10.9	10.9 + Loctite 270	12.9	12.9 + Loctite 270
<b>M6 x 1 mm</b>	9,5 – 10,5 N·m	10,5 – 11,5 N·m	14,3 – 15,7 N·m	15,2 – 16,8 N·m	16,2 – 17,8 N·m	18,1 – 20 N·m
<b>M8 x 1,25 mm</b>	23,8 – 26,2 N·m	25,6 – 28,4 N·m	34,2 – 37,8 N·m	36,7 – 40,5 N·m	39 – 43 N·m	43,7 – 48,3 N·m
<b>M10 x 1,5 mm</b>	48 – 53 N·m	52 – 58 N·m	68 – 75 N·m	73 – 81 N·m	80 – 88 N·m	88 – 97 N·m
<b>M12 x 1,75 mm</b>	82 – 91 N·m	90 – 100 N·m	116 – 128 N·m	126 – 139 N·m	139 – 153 N·m	152 – 168 N·m
<b>M14 x 2 mm</b>	129 – 143 N·m	143 – 158 N·m	182 – 202 N·m	200 – 221 N·m	221 – 244 N·m	238 – 263 N·m
<b>M16 x 2 mm</b>	200 – 221 N·m	219 – 242 N·m	283 – 312 N·m	309 – 341 N·m	337 – 373 N·m	371 – 410 N·m
<b>M18 x 2,5 mm</b>	276 – 305 N·m	299 – 331 N·m	390 – 431 N·m	428 – 473 N·m	466 – 515 N·m	509 – 562 N·m
<b>M20 x 2,5 mm</b>	390 – 431 N·m	428 – 473 N·m	553 – 611 N·m	603 – 667 N·m	660 – 730 N·m	722 – 798 N·m
<b>M22 x 2,5 mm</b>	523 – 578 N·m	575 – 635 N·m	746 – 824 N·m	817 – 903 N·m	893 – 987 N·m	974 – 1076 N·m
<b>M24 x 3 mm</b>	675 – 746 N·m	732 – 809 N·m	950 – 1050 N·m	1040 – 1150 N·m	1140 – 1260 N·m	1240 – 1370 N·m
<b>M27 x 3 mm</b>	998 – 1103 N·m	1088 – 1202 N·m	1411 – 1559 N·m	1539 – 1701 N·m	1710 – 1890 N·m	1838 – 2032 N·m
<b>M30 x 3,5 mm</b>	1378 – 1523 N·m	1473 – 1628 N·m	1914 – 2115 N·m	2085 – 2305 N·m	2280 – 2520 N·m	2494 – 2757 N·m



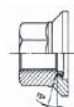
### FINE PITCH

SIZE OF BOLT	TYPE OF BOLT					
	8.8	8.8 + Loctite 270	10.9	10.9 + Loctite 270	12.9	12.9 + Loctite 270
<b>M8 x 1 mm</b>	25,7 – 28,3 N·m	27,5 – 30,5 N·m	36,2 – 39,8 N·m	40 – 44 N·m	42,8 – 47,2 N·m	47,5 – 52,5 N·m
<b>M10 x 1,25 mm</b>	49,4 – 54,6 N·m	55,2 – 61 N·m	71,5 – 78,5 N·m	78 – 86 N·m	86 – 94 N·m	93 – 103 N·m
<b>M12 x 1,25 mm</b>	90 – 100 N·m	98 – 109 N·m	128 – 142 N·m	139 – 154 N·m	152 – 168 N·m	166 – 184 N·m
<b>M12 x 1,5 mm</b>	86 – 95 N·m	94 – 104 N·m	120 – 132 N·m	133 – 147 N·m	143 – 158 N·m	159 – 175 N·m
<b>M14 x 1,5 mm</b>	143 – 158 N·m	157 – 173 N·m	200 – 222 N·m	219 – 242 N·m	238 – 263 N·m	261 – 289 N·m
<b>M16 x 1,5 mm</b>	214 – 236 N·m	233 – 257 N·m	302 – 334 N·m	333 – 368 N·m	361 – 399 N·m	394 – 436 N·m
<b>M18 x 1,5 mm</b>	312 – 345 N·m	342 – 378 N·m	442 – 489 N·m	485 – 536 N·m	527 – 583 N·m	580 – 641 N·m
<b>M20 x 1,5 mm</b>	437 – 483 N·m	475 – 525 N·m	613 – 677 N·m	674 – 745 N·m	736 – 814 N·m	808 – 893 N·m
<b>M22 x 1,5 mm</b>	581 – 642 N·m	637 – 704 N·m	822 – 908 N·m	903 – 998 N·m	998 – 1103 N·m	1078 – 1191 N·m
<b>M24 x 2 mm</b>	741 – 819 N·m	808 – 893 N·m	1045 – 1155 N·m	1140 – 1260 N·m	1235 – 1365 N·m	1363 – 1507 N·m
<b>M27 x 2 mm</b>	1083 – 1197 N·m	1178 – 1302 N·m	1520 – 1680 N·m	1672 – 1848 N·m	1834 – 2027 N·m	2000 – 2210 N·m
<b>M30 x 2 mm</b>	1511 – 1670 N·m	1648 – 1822 N·m	2138 – 2363 N·m	2332 – 2577 N·m	2565 – 2835 N·m	2788 – 3082 N·m

# WHEEL NUT TIGHTENING TORQUES

## WHEEL NUT TIGHTENING TORQUES

Wheel nut tightening torques recommended from rim's O.E.M. with reference to the quality of the rim's material.

WHEEL NUT TIGHTENING TORQUES				
CHARACTERISTICS	ILLUSTRATION	WHEEL STUD THREAD	RECOMMENDED WHEEL NUTS TORQUE	
			RIM MATERIAL QUALITY	
			ST 37	**ST 52
WHEEL NUTS WITH INTEGRATE SPHERICAL COLLAR		M18 x 1,5 mm	330 N·m	460 N·m
		M20 x 1,5 mm	490 N·m	630 N·m
		M22 x 1,5 mm	630 N·m	740 N·m
FLAT COLLAR WHEEL NUTS WITH SEPARATE SPHERICAL LOCK WASHER		M18 x 1,5 mm	270 N·m	360 N·m
		M20 x 1,5 mm	360 N·m	450 N·m
		M22 x 1,5 mm	460 N·m	550 N·m
WHEEL NUTS WITH INTEGRATE SEAT CAPTIVE WASHER		M18 x 1,5 mm	260 N·m	360 N·m
		M20 x 1,5 mm	350 N·m	500 N·m
		M22 x 1,5 mm	450 N·m	650 N·m

**\*\*RIM MATERIAL ST 52 IS RECOMMENDED BY DANA ON AXLE APPLICATIONS. IT IS THE OPTIMUM MATERIAL FOR TIGHTENING THE RIM TO THE HUB.**

### NOTE:

The wheel nut tightening torque is related only on nut thread and stud thread dry. (Without oil or any lubricant).

### NOTE:

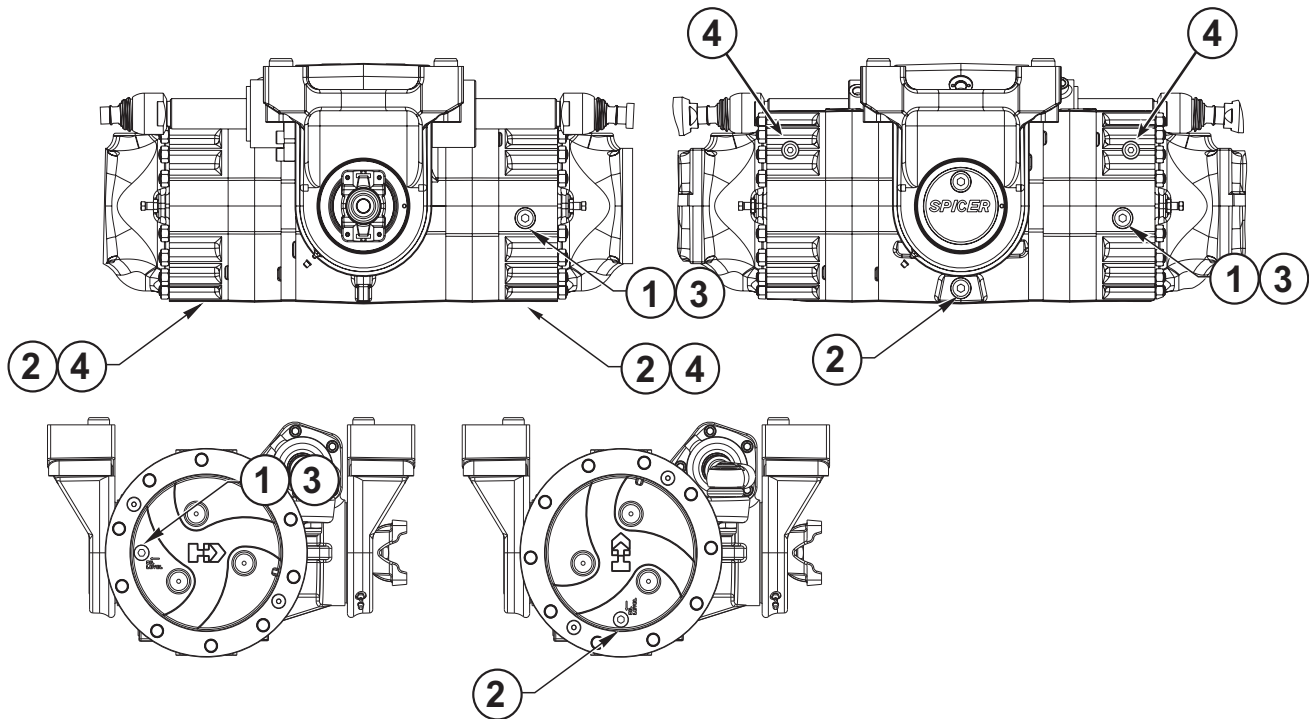
The wheel nut tightening torque takes into consideration not only the nut + stud characteristics, but also the quality of the rim material.

THE DANA OFFICIAL TIGHTENING TORQUE TABLE, THAT IS INCLUDED IN EACH SERVICE MANUAL, SHOWS THE TORQUE FIGURE RELATED TO THE BOLT CHARACTERISTIC ONLY.		
DANA OFFICIAL TIGHTENING TORQUE TABLE		
NUT MATERIAL QUALITY 8.8 & 10.9	STUD MATERIAL QUALITY 10.9	*ALLOW TIGHT TORQUE
M18 x 1,5 mm	M18 x 1,5 N·m	442 ÷ 489 N·m
M20 x 1,5 mm	M20 x 1,5 N·m	613 ÷ 677 N·m
M22 x 1,5 mm	M22 x 1,5 N·m	822 ÷ 908 N·m

**\*THE TORQUE FIGURE ON NUT AND STUD COUPLING MUST BE RELATED ON STUD MATERIAL QUALITY (DANA AXLES ARE 10.9 ONLY).**

## MAINTENANCE

### MAINTENANCE POINTS



- 1 - Oil filling plug
- 2 - Oil draining plug
- 3 - Check level plug
- 4 - Check brake disc wear  
Minimum thickness between counter discs is 5.2 mm.

#### **NOTE:**

For details see **BRAKE WEAR CHECK PROCEDURE** p. 51.

# OIL DRAINING MANDATORY PROCEDURE

## OIL DRAINING MANDATORY PROCEDURE

### **WARNING**

- Do not attempt any maintenance if the axle is hot (40-50°C / 104-122°F). Hot oil and components can cause personal injury. Avoid skin contact. Wear protective gloves and glasses.
- Make sure all fluids are contained during inspection, maintenance, tests, adjustment and repair of the product. Prepare a suitable container to collect the fluid before removing any component containing fluids. Dispose of all fluids following legal and local regulations.

### **CENTRAL HOUSING**

Before draining oil it is mandatory to loosen the oil filling plug or the breather (if present), and wait until the internal pressure is completely released. Remove the oil draining plug and drain oil only when the pressure is completely released.

### **PLANETARY GEAR REDUCTION**

Before draining oil it is mandatory to rotate the planetary gear reduction in order to move the oil plug in filling position, then loosen the oil plug and wait until the internal pressure is completely released. Remove the oil plug and drain oil only when the pressure is completely released.



## MAINTENANCE INTERVALS

OPERATION	COMPARTMENT	1ST CHANGE / CHECK (whs)	FREQUENCY (whs)	LUBRICANTS	REMARKS
Oil level check	All	10 whs	Monthly	For details see below	Clean carefully oil plug magnet
Oil Change	Differential	100 - 250 whs max. *	1000 whs	Central body standard bevel gears - UTTO (API GL4), or gear: J20/C, MF M1143, or gear: SAE80W/90 (API GL4 or GL5)	If with limited slip differential, and/or wet brakes, use LS additivated oils. Clean carefully oil plug magnet.
	Hub Reduction	100 - 250 whs max. *		Central body hypoid bevel gears - SAE80W/90 (API GL5)	
				UTTO (API GL4) J20/C; or gear: SAE80W/90 (API GL4 or GL5)	Clean carefully oil plug magnet.
	Dropbox (if any)	100 - 250 whs max. *		Gears with wet discs clutch - ATF GM Dexron IIE, Dexron III Only gears - UTTO J20/C, or gear: SAE80W/90 (API GL4 or GL5)	Clean carefully oil plug magnet. * in accordance with Machine Service requirements
Adjustment	Negative brake (SAHR)	100 whs	Every 500 whs	For hydraulic actuations (brakes, SAHR, 100% diff. lock, etc.) use ATF oil e.g. GM Dexron IIE; Dexron III	Not applicable
	Service brake				DOT brake fluids oils are NOT compatible w/std oils
Tightening	Wheel nuts	10 whs	Every 200 whs	No lubricant allowed	Check for any damage or corrosion of treads or mating surfaces
Greasing	King Pin Tapered Bearings	10 whs	Normal work – Weekly or Severe duty – Daily	NLGI2 EP or NLGI3 EP	Supply grease until clean grease is visible from outside.
	Seals	10 whs			Grease performance level acc. to: Ac-
	King Pin Bushings	10 whs		NLGI2 EP or NLGI3 EP with Moly Additive	cording to DIN 51825 level KP2K-30 (NLGI2) or KP3K-20 (NLGI3); ASTM
	Trunnion Bushings	10 whs			D4950 NLGI2 GC-LB

In case of severe duty, half oil change intervals must be applied.

In case of extreme environments, chatter noise, reduce oil change intervals accordingly.

In case of extremely low ambient temperatures (<-20°C), use appropriate oils w/ low viscosity: UTTO J20/D (std Bevel Gears), SAE 75W/90 API GL5 LS (Hypoid Bevel Gears: models 192, 193, 194).

API GL5: Acc. To MIL L-2105-B

See PSB 00279 (latest update) for more info regarding lubricants and viscosity grades.

# LUBRICANT & SEALANT SPECIFICATIONS

## LUBRICANT & SEALANT SPECIFICATIONS

1 - Locking, sealing and lubricating materials referred to in this manual are the same used in the shop-floor.

2 - The table below gives an account of the typical applications of each single material, in order to facilitate replacement with similar products marketed by different brand names with different trade marks.

### **LOCTITE 242**

Anaerobic product apt to prevent the loosening of screws, nuts and plugs. Used for medium-strength locking. Before using it, completely remove any lubricant by using the specific activator.

### **LOCTITE 243**

The oleocompatible alternative to 242. Does not require the activation of lubricated surfaces.

### **LOCTITE 270**

Anaerobic product for very-high strength locking of screws and nuts. Before using it, completely remove any lubricant by using the specific activator.

To remove parts, it may be necessary to heat them at 80° C approximately.

### **LOCTITE 275**

Anaerobic product suitable for high-strength locking and sealing of large threaded parts, bolts and stud bolts, for pipe sealing and for protecting parts against tampering; suitable for sealing coupling surfaces with a maximum diametrical clearance of 0.25 mm.

### **LOCTITE 510**

Anaerobic product for the hermetic sealing of flanged units and screw holes communicating with fluids. Can seal clearances between flanges up to 0.2 mm.

### **LOCTITE 577**

Quick anaerobic sealant for sealing threaded portions of conical or cylindrical unions up to M80. Before using it, remove any lubricant with the specific activator. After polymerisation, disassembly may result rather difficult, so heating may be necessary for larger diameters.

### **LOCTITE 638**

Anaerobic adhesive for fast and high-strength gluing of cylindrical metal joints (hub on shaft). Can glue together parts with clearance ranging between 0.1 and 0.25 mm.

### **LOCTITE 648**

Anaerobic adhesive for fast and medium-strength gluing of cylindrical metal joints (hub on shaft). Can glue together parts with radial clearance below 0.1 mm.

### **AREXONS (REPOSITIONABLE JOINTING COMPOUND FOR SEALS)**

Solvent-based sealing compound for elastic seals, drying through evaporation. Used for sealing the outer diameter of sealing rings for rotating shafts with outer metal reinforcement.

### **SILICONE**

Semi-fluid adhesive material used for sealing and filling and to protect components from environmental and physical elements. Polymerises with non-corrosive dampness.

### **TECNO LUBE/101 (SILICONE-BASED GREASE)**

Highly adhesive synthetic grease, with silicone compounds added.

Applied to adjustment screws with hole communicating with oil-type fluids.

Used when frequent adjusting is required.

### **MOLIKOTE (DOW CORNING)**





Lubricating compound containing molybdenum disulphide, used to lubricate articulation pins and to prevent sticking and oxidation of parts that are not lubricated on a regular basis.

### **(LITHIUM-BASED) GREASE**

Applied to bearings, sliding parts and used to lubricate seals or parts during assembly.

## SAFETY PRECAUTIONS

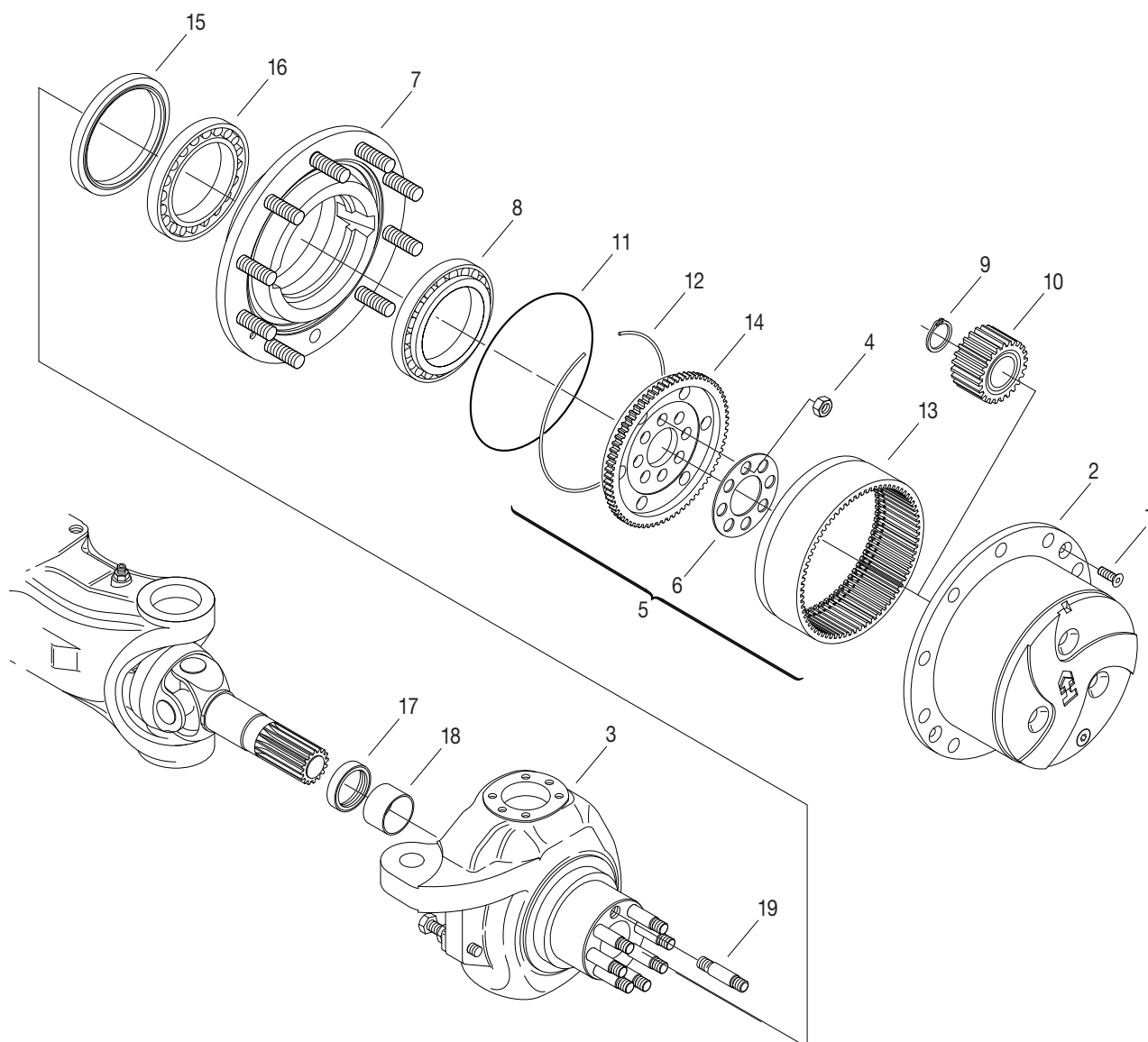
- 1 - During all operations described in this manual, the axle should be fastened onto a trestle, while the other parts mentioned should rest on supporting benches.
- 2 - When removing one of the arms, an anti-tilting safety trestle should be placed under the other arm.
- 3 - When working on an arm that is fitted on the machine, make sure that the supporting trestles are correctly positioned and that the machine is locked lengthways.
- 4 - Do not admit any other person inside the work area; mark off the area, hang warning signs and remove the ignition key from the machine.
- 5 - Use only clean, quality tools; discard all worn, damaged, lowquality or improvised wrenches and tools. Ensure that all torque wrenches have been checked and calibrated.
- 6 - During maintenance operations, always wear protective glasses, safety footwear, protective gloves and all P.P.E. (Personal Protective Equipment) in function of the risks which the workers may be exposed to.
- 7 - Should you stain a surface with oil, remove marks straight away.
- 8 - Dispose of all lubricants, seals, rags and solvents once work has been completed. Treat them as special waste and dispose of them according to the relative law provisions obtaining in the country where the axles are being overhauled.
- 9 - Make sure that only weak solvents are used for cleaning purposes; avoid using turpentine, dilutants and toluol, xylolbased or similar solvents; use light solvents such as Kerosene, mineral spirits or water-based, environment friendly solvents.
- 10 - For the sake of clarity, the parts that do not normally need to be removed have not been reproduced in some of the diagrams.
- 11 - After repair work has been completed, accurately touch up any coated part that may have been damaged.
- 12 - Follow all safety instructions in the Original Equipment Manufacturer (OEM) manual that came with the vehicle.
- 13 - Before draining oil, release the internal pressure, for details see OIL DRAINING MANDATORY PROCEDURE p. 12.

	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
	Indicates an imminently hazardous situation which, if not avoided, could result in death or serious injury.
	Indicates a situation which, if not avoided, may result in damage to components.
	Indicates information which may make product service easier to perform.



# PLANETARY REDUCTION GEAR

## EXPLODED VIEW

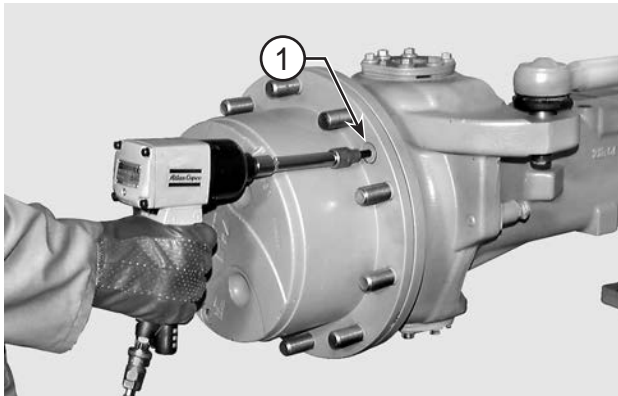


# DISASSEMBLY

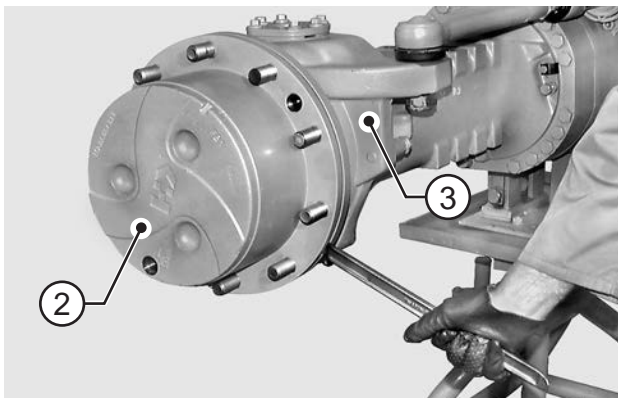
## DISASSEMBLY

### ⚠ CAUTION

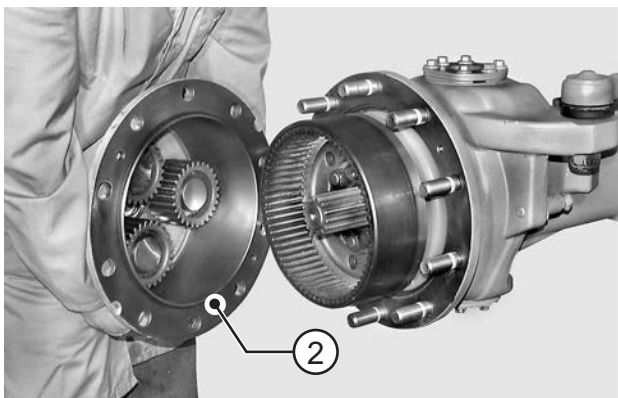
Before draining oil, release the internal pressure, for details see OIL DRAINING MANDATORY PROCEDURE p. 12.



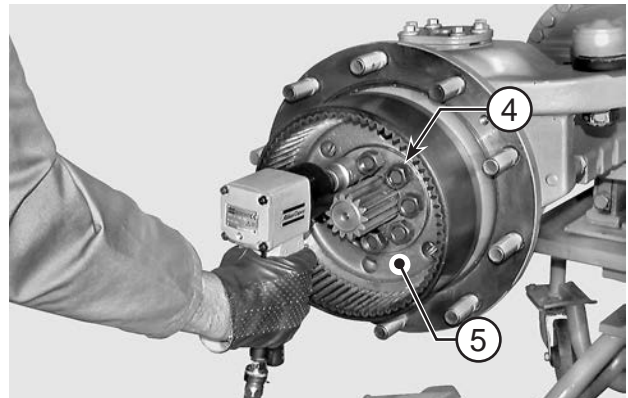
**FIGURE 1:** Remove check screws (1) from planetary cover.



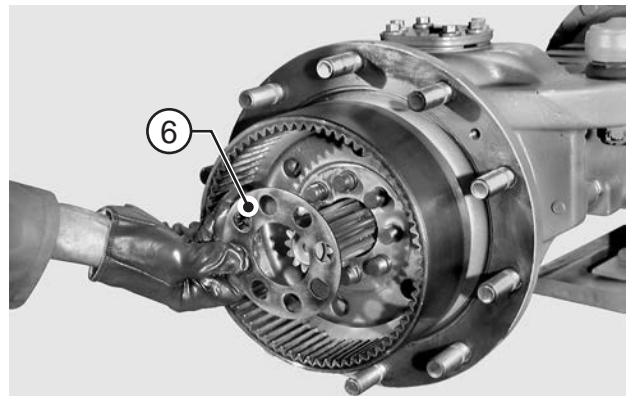
**FIGURE 2:** Alternately insert a lever in the slots provided and pry to separate the planetary cover (2) from the steering case (3).



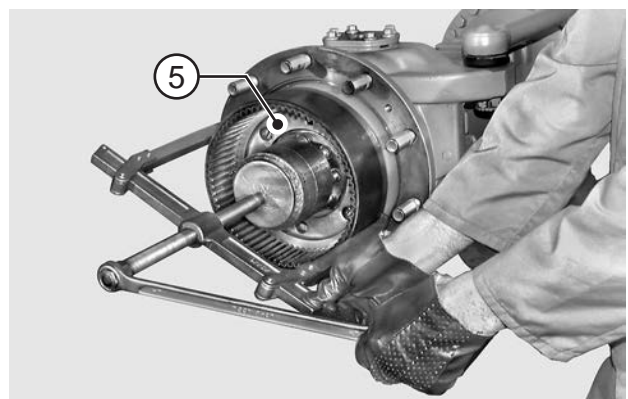
**FIGURE 3:** Remove the complete planetary cover (2).



**FIGURE 4:** Loosen and remove the nuts (4) that lock the gear safety flange (5).

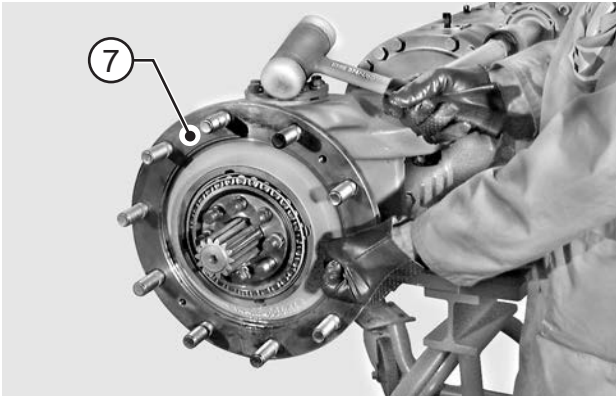


**FIGURE 5:** Remove safety flange (6).



**FIGURE 6:** Remove the complete ring gear flange (5) by using a puller and applying counter pressure to the studs.

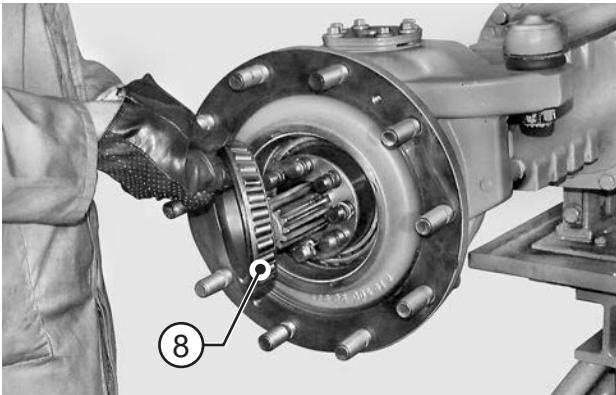




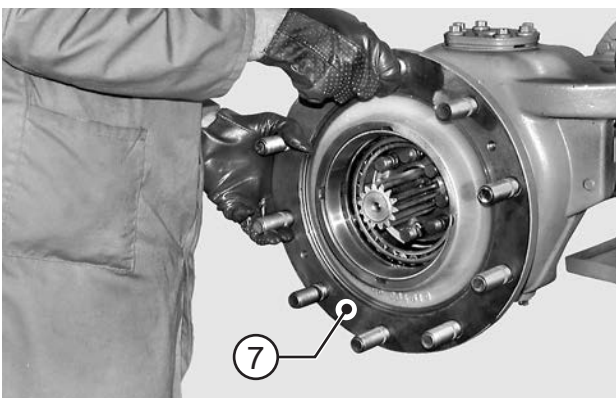
**FIGURE 7:** Partially extract the wheel hub (7) by using a plastic hammer.

**NOTE:**

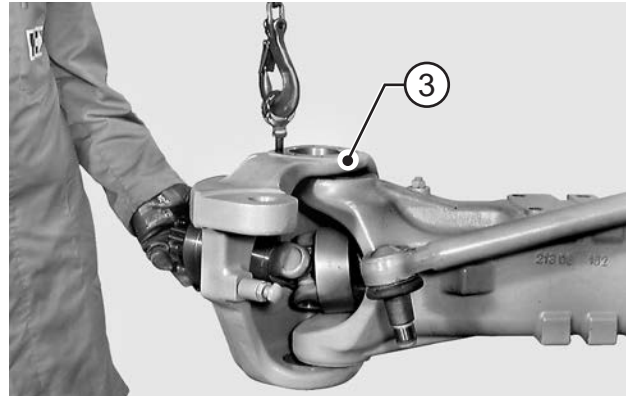
**Hammer alternately on several equidistant points.**



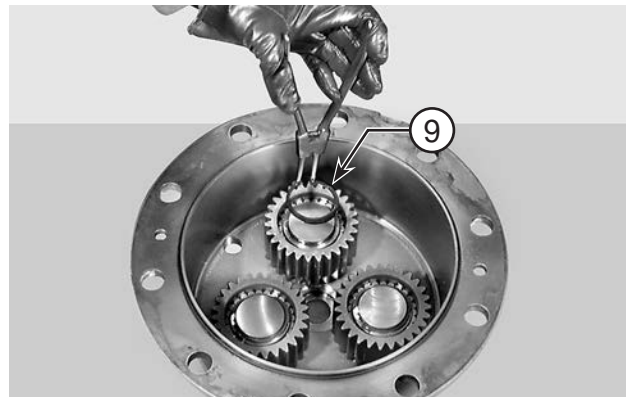
**FIGURE 8:** Remove the external bearing (8).



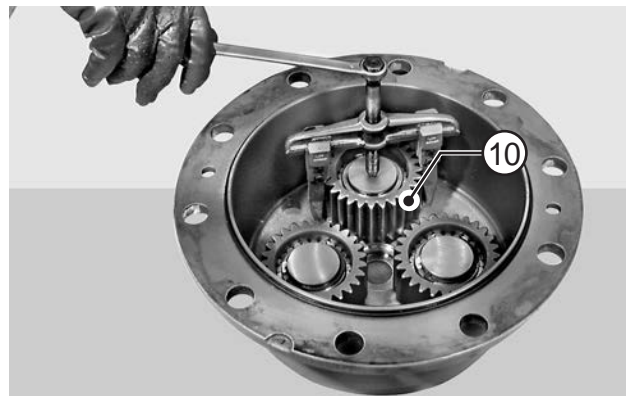
**FIGURE 9:** Draw out the wheel hub (7).



**FIGURE 10:** Take out the pins and remove the steering case (3).  
For pin removal details, see PLANETARY REDUCTION GEAR p. 17.



**FIGURE 11:** Remove the snap rings (9).

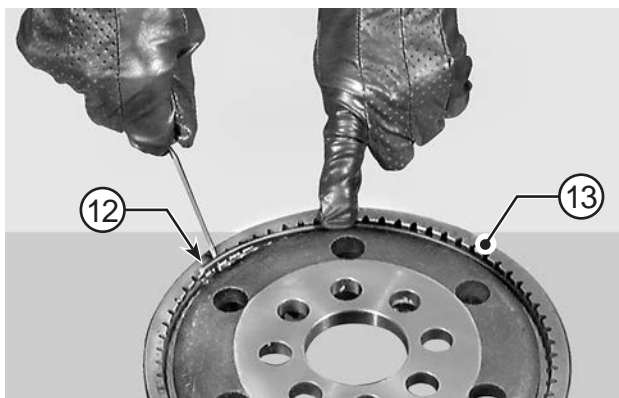


**FIGURE 12:** Using a puller, remove the planetary gears (10).

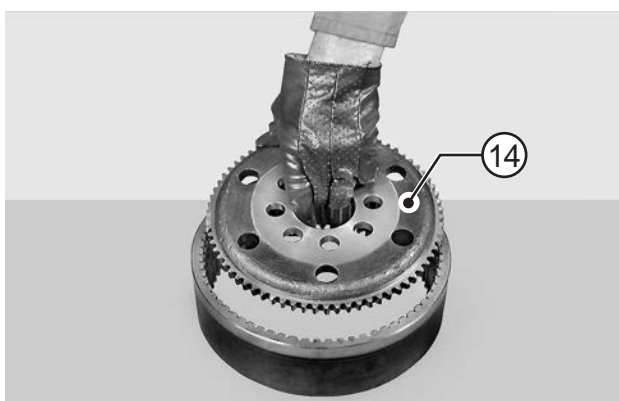
**NOTE:**

**Write down direction of installation of planetary gears.**

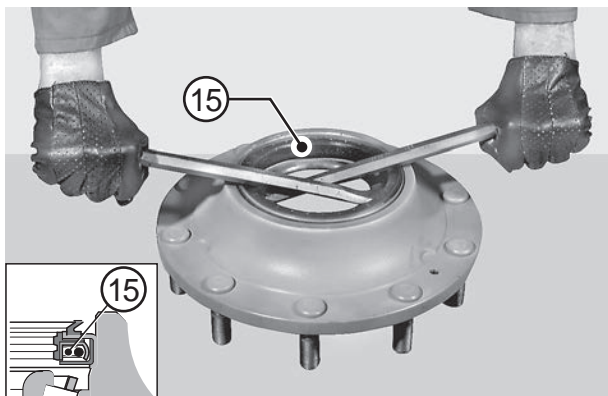
# DISASSEMBLY



**FIGURE 13:** Remove the ring gear (13) snap ring (12).



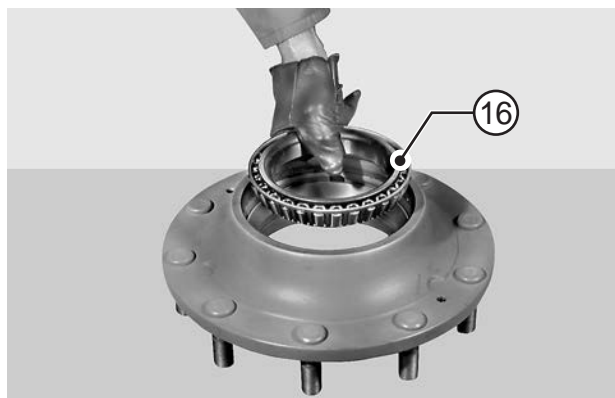
**FIGURE 14:** Remove ring gear flange (14).



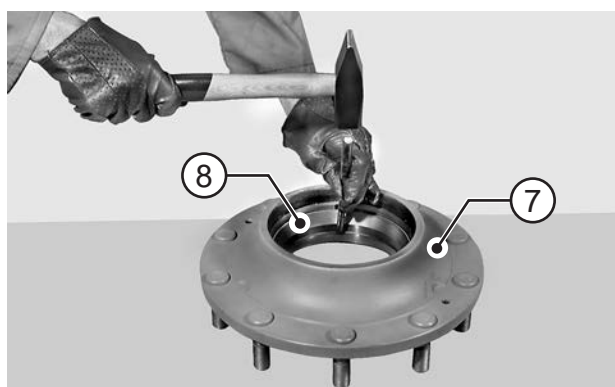
**FIGURE 15:** Remove seal ring (15) from wheel hub (7).

**NOTE:**

Mark the seal ring position.



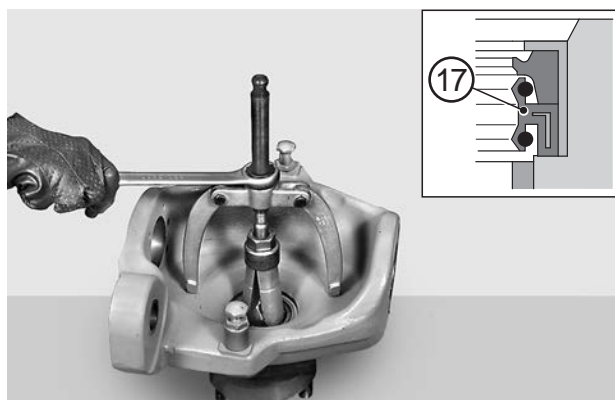
**FIGURE 16:** Remove inner bearing (16).



**FIGURE 17:** Remove the outer thrust blocks of bearings (8) (16) by driving a pin driver in the slots provided on the hub (7).

**NOTE:**

Hammer alternately to avoid thrust block clamping and deformation.

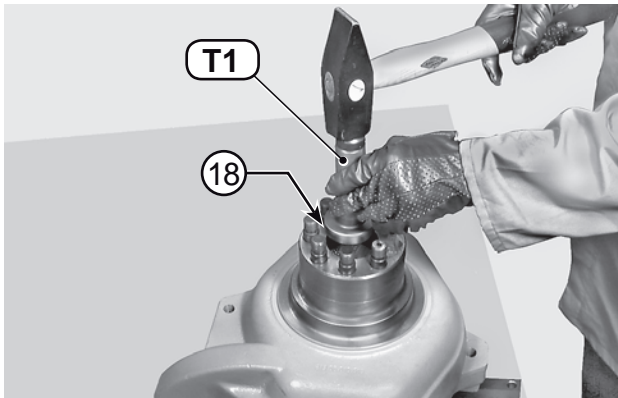


**FIGURE 18:** Using a puller, remove seal ring (17) from steering case (3).

**NOTE:**

Write down seal ring orientation.

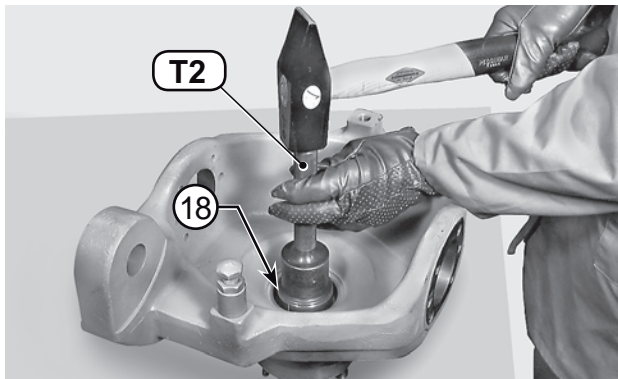




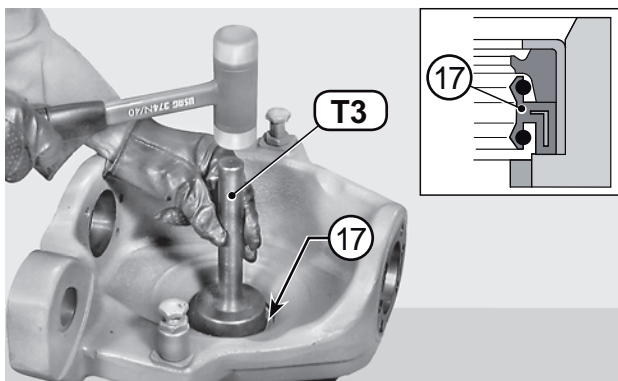
**FIGURE 19:** Using driver T1 (See drawing T1 p. 26), extract the guide bushing (18) of twin u-joint. Only if necessary, remove any damaged studs (19), which need to be replaced.

# ASSEMBLY

## ASSEMBLY



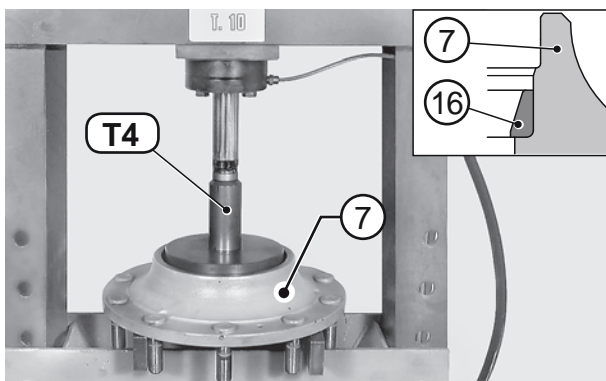
**FIGURE 20:** Fit the bushing (18) in the steering case (3) using tool T2 (See drawing T2 p. 26).



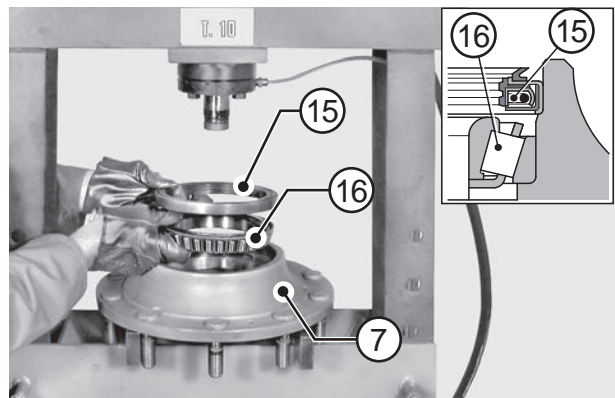
**FIGURE 21:** Apply a coat of AREXONS rubber cement to the outer metal surface of the snap ring (17). Position the seal ring and, using tool T3 (See drawing T3 p. 27), fit it in the appropriate seat.

### ⚠ CAUTION

Check direction of installation carefully.



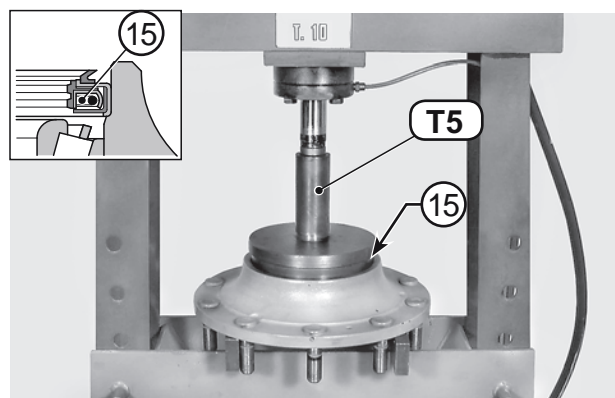
**FIGURE 22:** Position the wheel hub (7) under a press; lubricate the outer seat of bearing and, using tool T4 (See drawing T4 p. 28), install the thrust block of bearing (16).



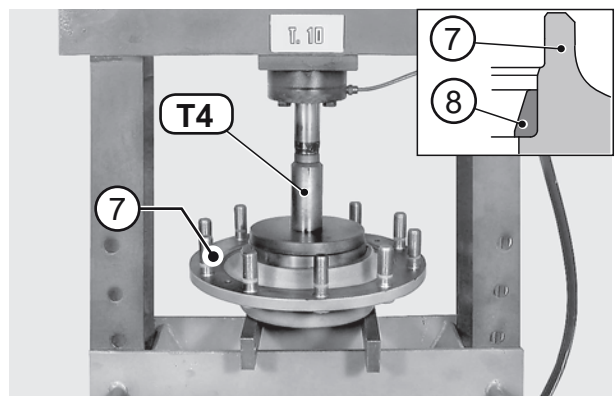
**FIGURE 23:** Install bearing (16). Apply Arexons seal rubber cement to the outer surface of seal ring (15). Position the seal ring (15) in the hub (7).

### ⚠ CAUTION

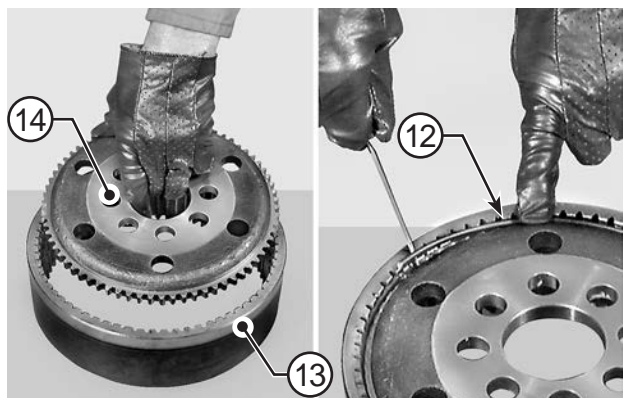
Check ring orientation carefully.



**FIGURE 24:** Position tool T5 (See drawing T5 p. 29) and press the seal ring (15) into its seat.



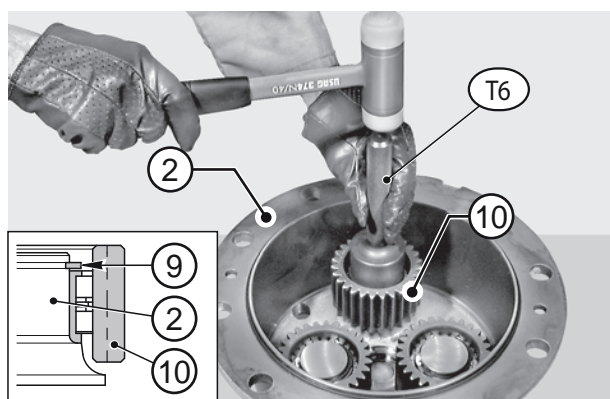
**FIGURE 25:** Turn the hub over (7), lubricate bearing seat and, using tool T4 (See drawing T4 p. 28) install the bearing thrust block (8).



**FIGURE 26:** Fit the flange (14) in the ring gear (13) and lock into position with snap ring (12).

**NOTE:**

Check that snap ring (12) is fully inserted in the slot of ring gear (13).

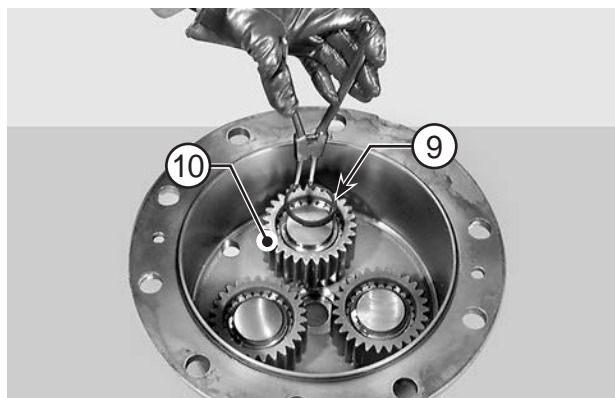


**FIGURE 27:** Mount gears (10) onto the pins of the planetary cover (2).

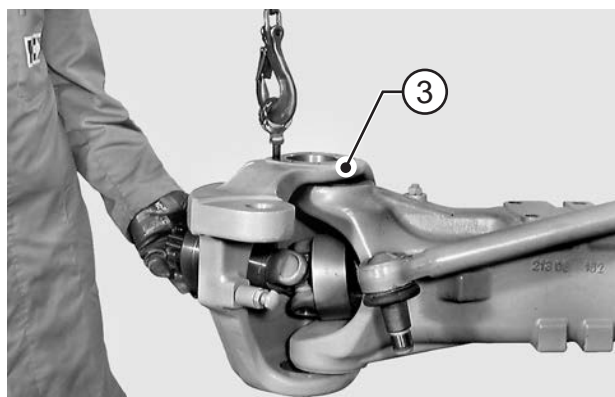
To insert gears, use tool T6 (See drawing T6 p. 29).

## CAUTION

The radiused part of bearings' inner ring must face the bottom of the pin.

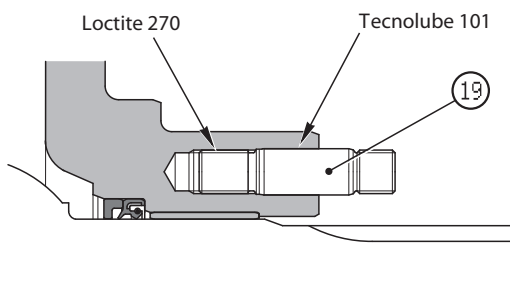


**FIGURE 28:** Lock gears (10) into position by installing the snap rings (9).



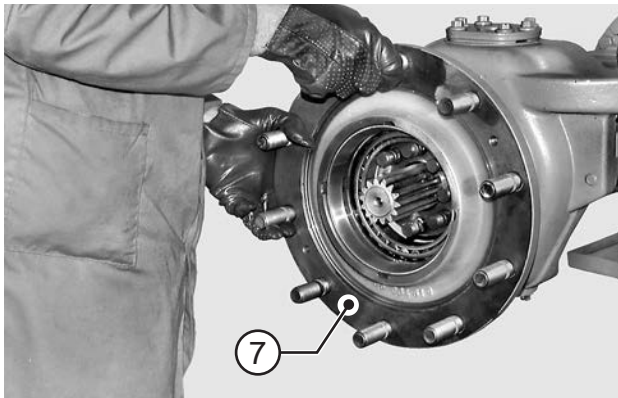
**FIGURE 29:** Oil the seal ring and bushing. Slip the steering case (3) onto the twin u-joint and fit the pivot pins and connect the steering bar.

For details, see PLANETARY REDUCTION GEAR p. 17.

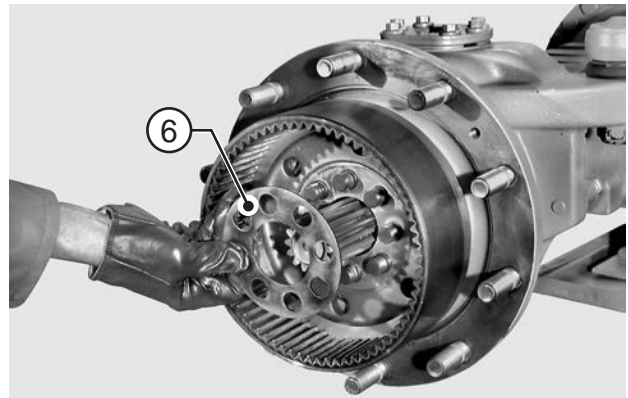


**FIGURE 30:** Only if studs have been removed. Apply a coat of Loctite 270 to the fast end of studs (19) and apply TecnoLube 101 to ground nut end; tighten studs (19) as far as they will go.

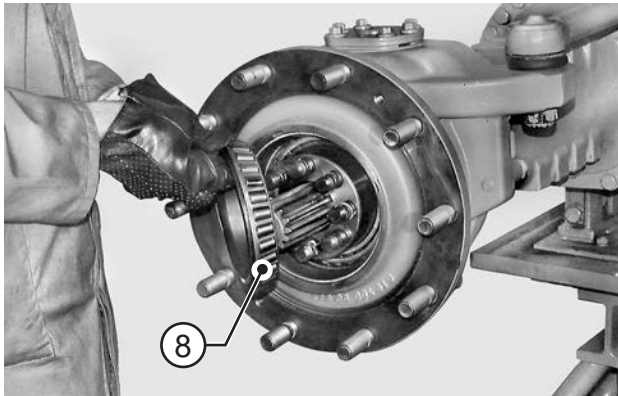
# ASSEMBLY



**FIGURE 31:** Install the wheel hub (7) onto the steering case (3).



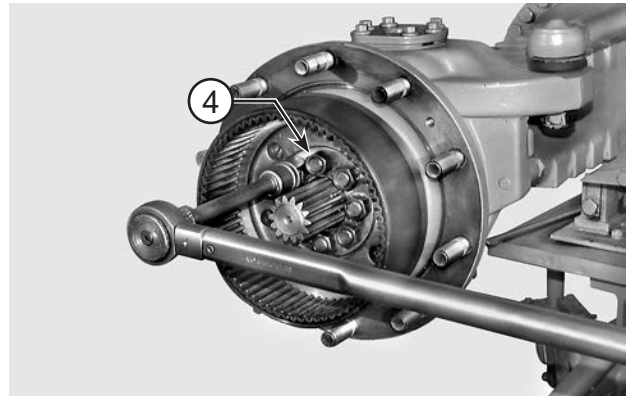
**FIGURE 34:** Ensure that faces are thoroughly cleaned, and then mount the safety flange (6).



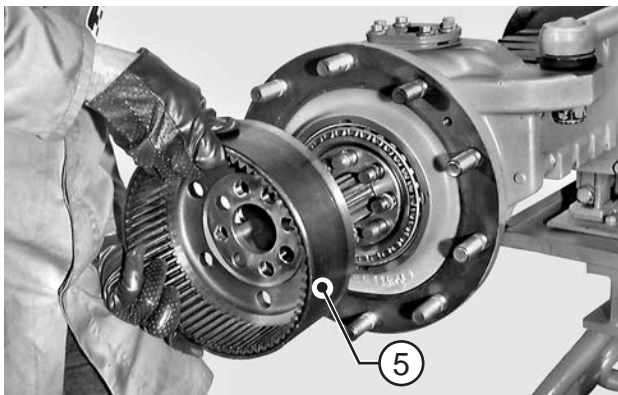
**FIGURE 32:** Install the outer bearing (8).

## **NOTE:**

Push the bearing as far as it will go by tapping with a plastic hammer all around the rim.



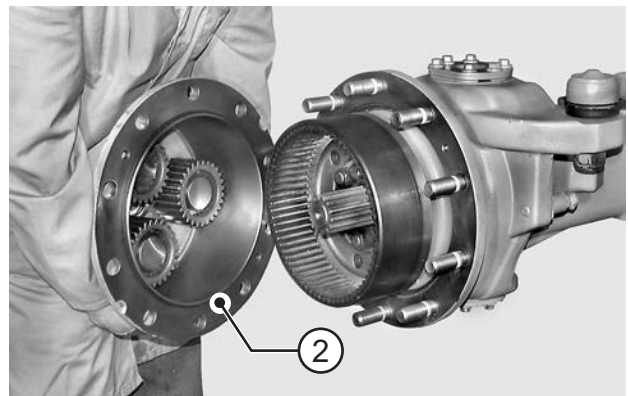
**FIGURE 35:** Apply Loctite 242 to the studs and tighten nuts (4).  
Tighten nuts (4) in two stages using the criss-cross method.  
Initial tightening torque: 250 N·m.  
Final tightening torque: 460 - 465 N·m.



**FIGURE 33:** Install the complete ring gear flange (5).

## **NOTE:**

To engage the flange (5), use a plastic hammer and hammer alternately on several equidistant points.

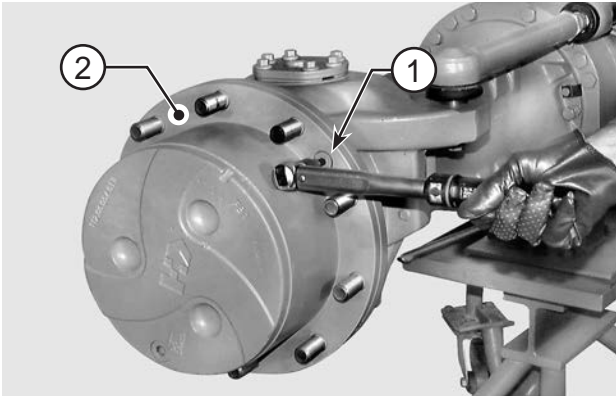


**FIGURE 36:** Fit the planetary cover (2) on the wheel hub (7).

## **CAUTION**

Check state and position of o-ring (11).





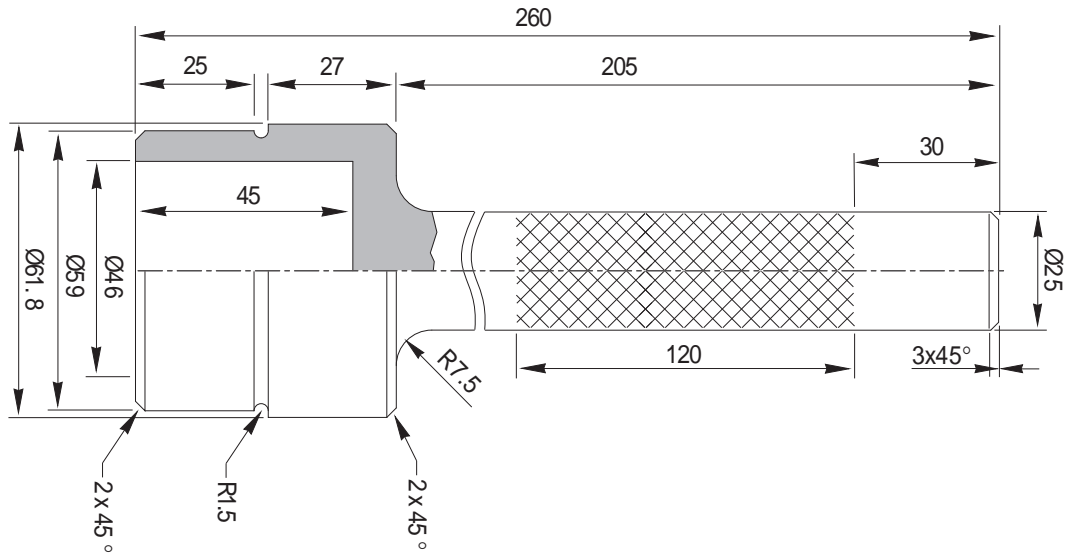
**FIGURE 37:** Lock the planetary cover (2) with screws (1).  
Tightening torque for screws: 40 - 50 N·m.

# SPECIAL TOOLS

## SPECIAL TOOLS

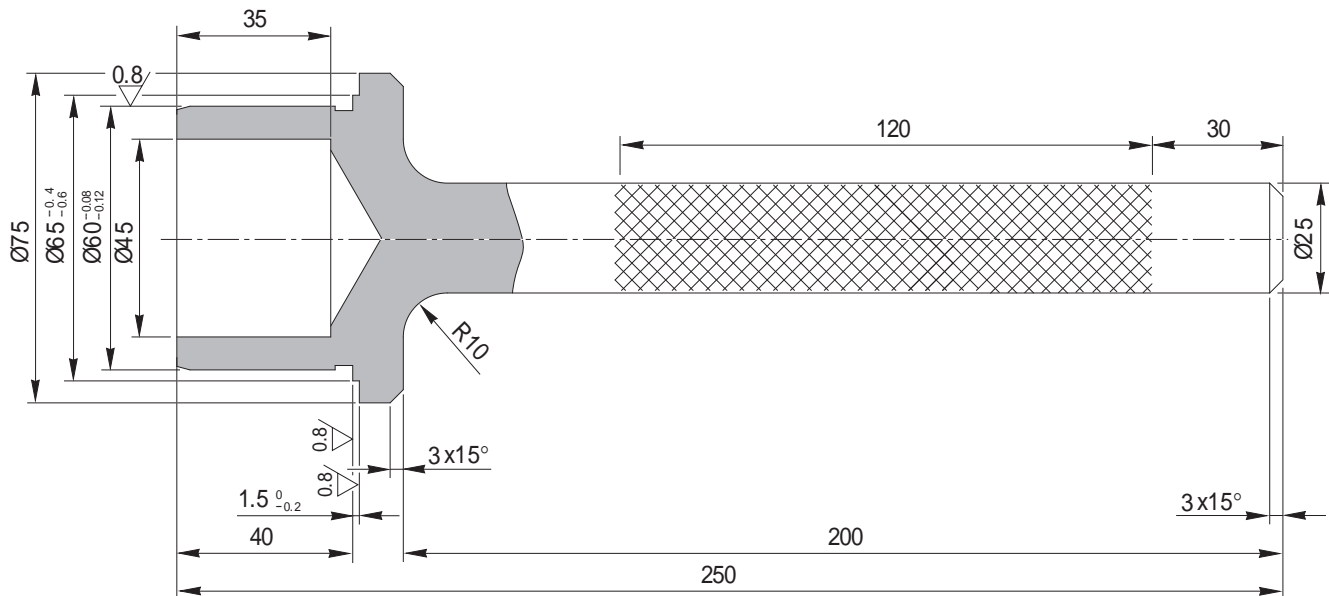
### T1

P/N: 2364



### T2

P/N: 3348

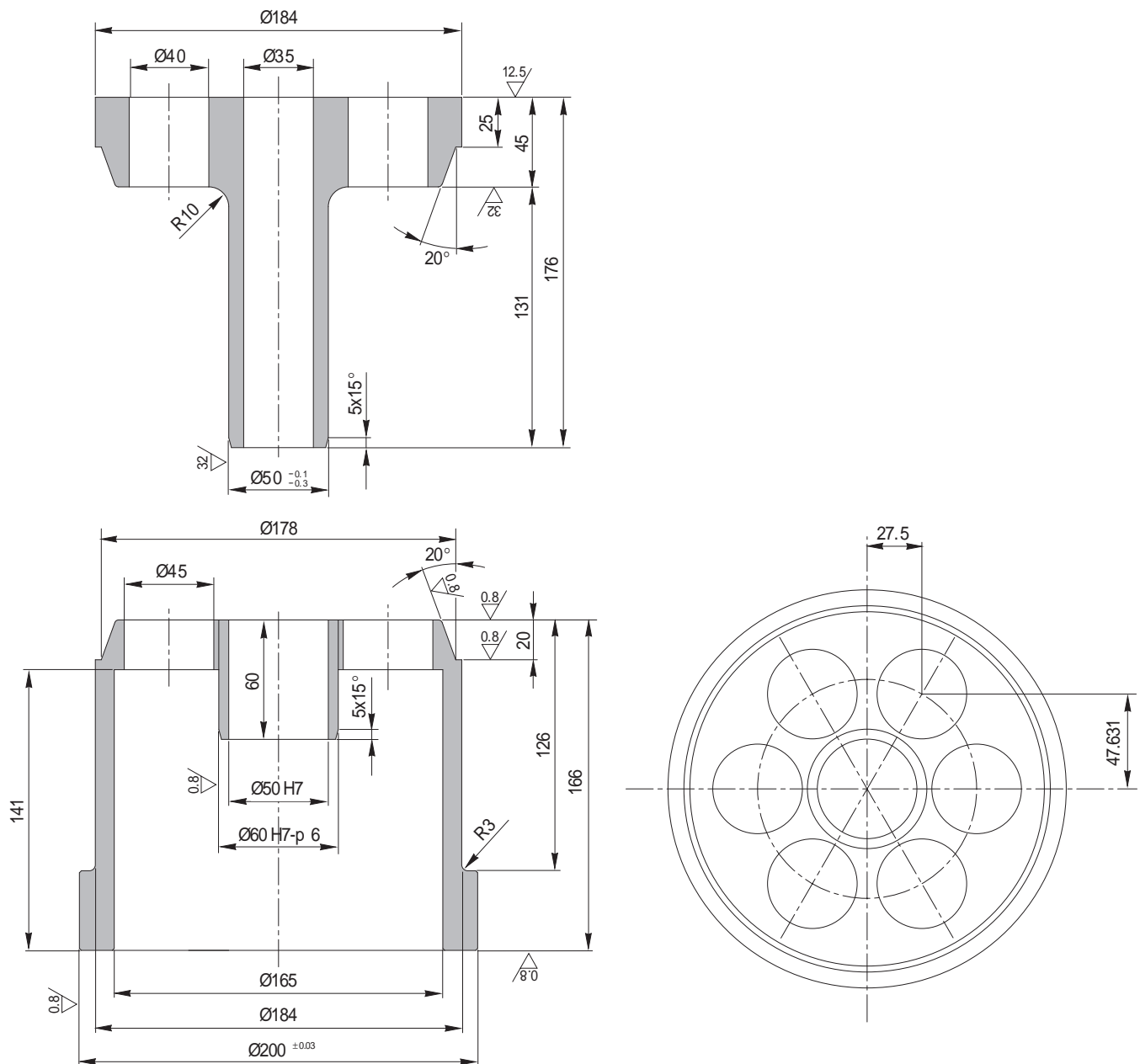




# SPECIAL TOOLS

T4

P/N: 3265



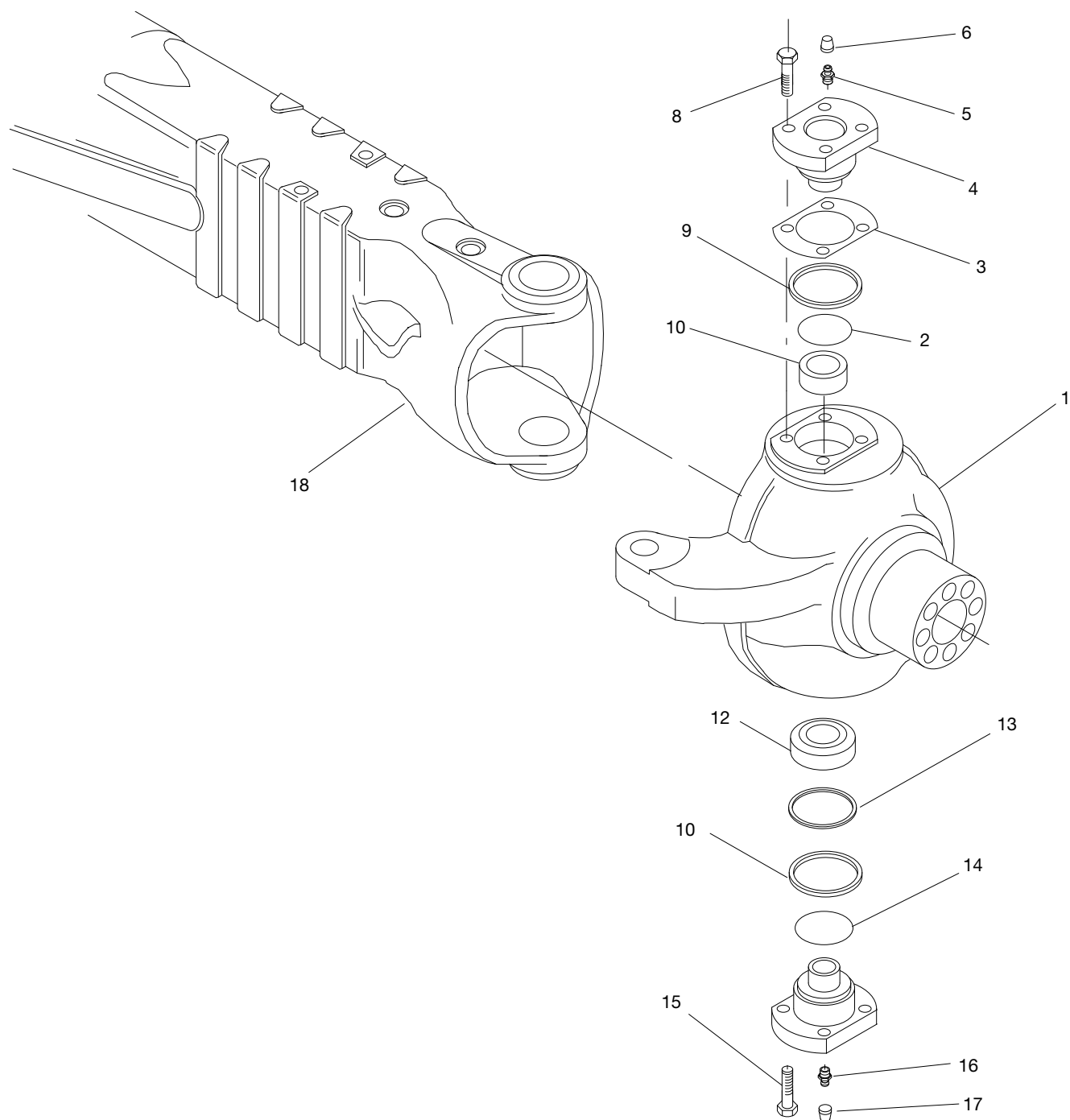






# COMPLETE STEERING CASE

## EXPLODED VIEW

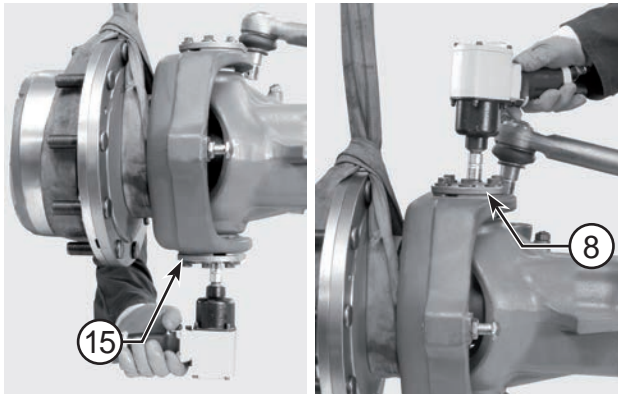


# DISASSEMBLY

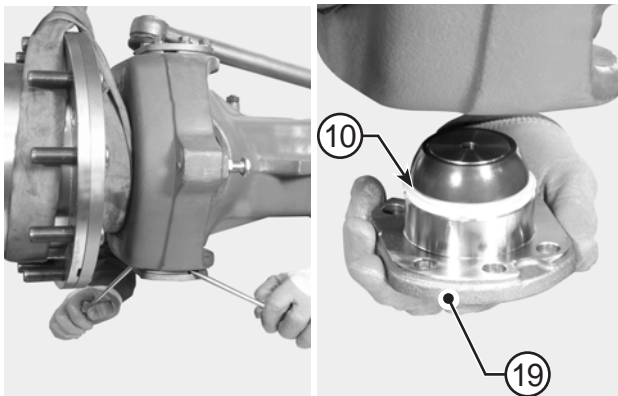
## DISASSEMBLY

### ⚠ CAUTION

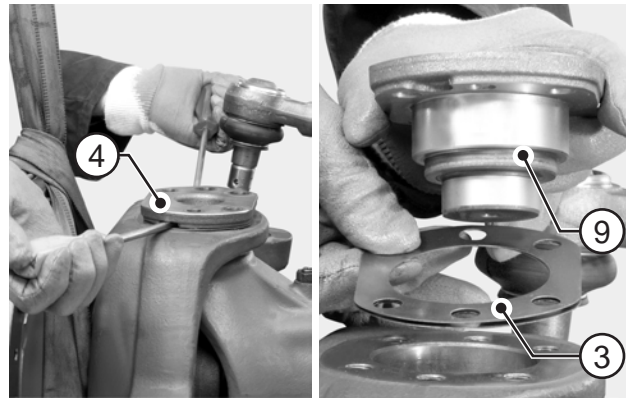
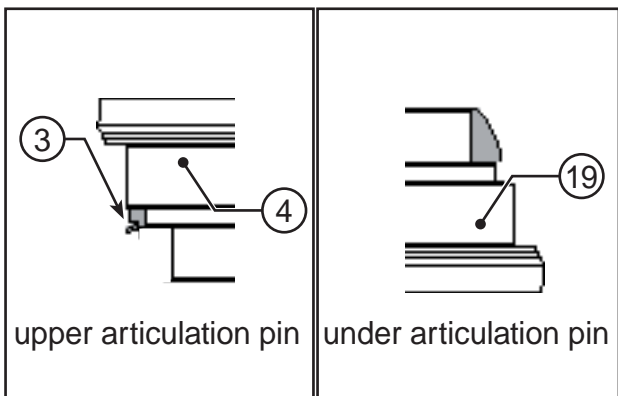
Before draining oil, release the internal pressure, for details see OIL DRAINING MANDATORY PROCEDURE p. 12.



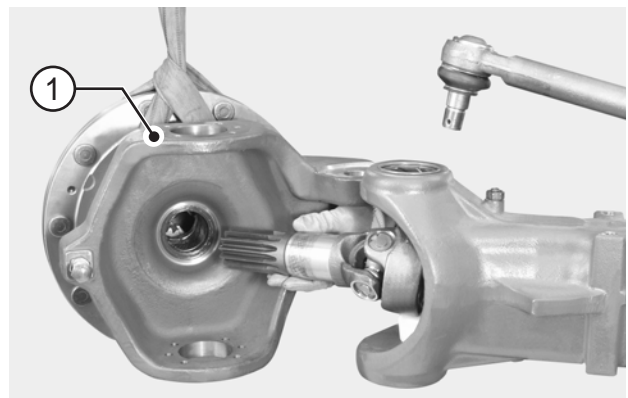
**FIGURE 1:** Loosen and remove the capscrews (15, 8) from the articulation pin (19, 4).



**FIGURE 2:** Remove the bottom articulation (19) pin complete with front sealing ring (10).

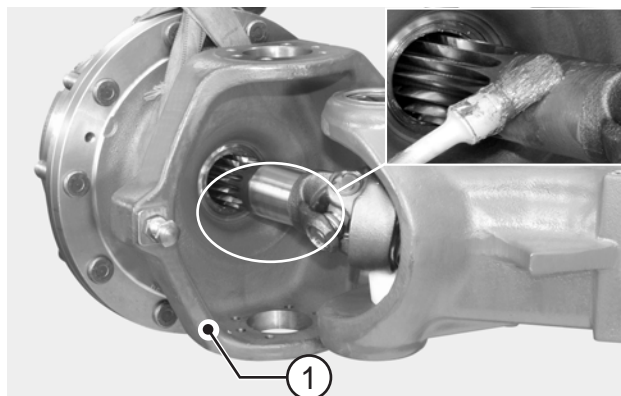


**FIGURE 3:** Using two levers, remove the top articulation pin (4) complete with front seal (9) and shims (3) . Pay attention not to damage the surfaces.

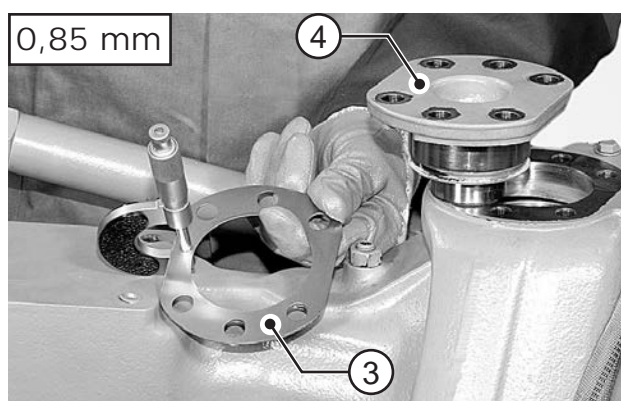


**FIGURE 4:** Remove the complete steering case (1).

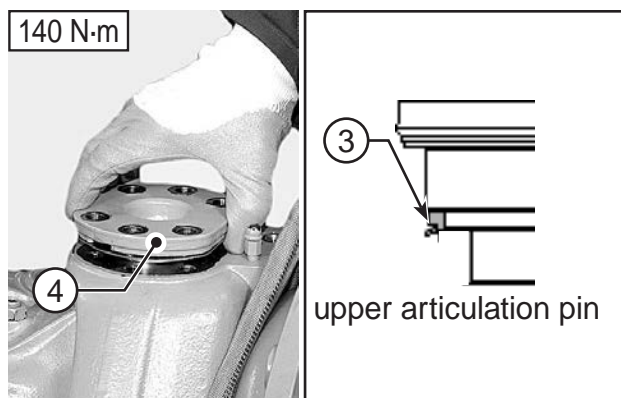
## ASSEMBLY



**FIGURE 5:** Lubricate the terminal of the u-joint and install the steering case (1). Pay attention not to damage the dust cover rings and the sealing rings.



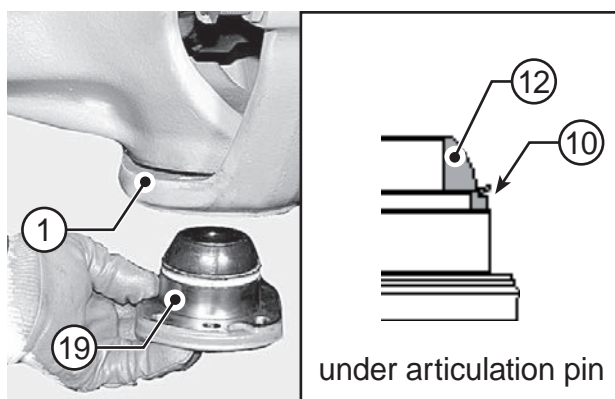
**FIGURE 6:** Prepare a series of shims (3) of 0,85 mm to be assembled under the upper pin (4).



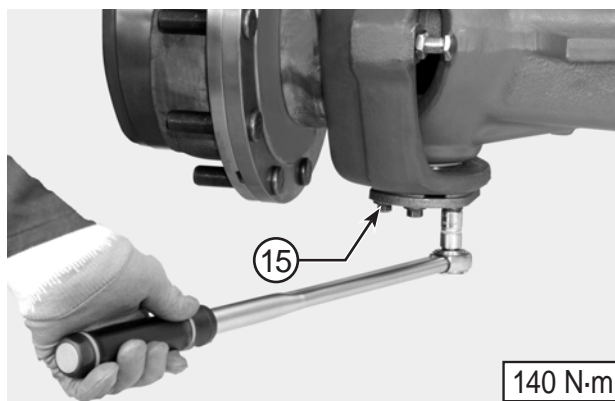
**FIGURE 7:** Fit a new seal (3) onto the top articulation pin (4). Lubricate and install the unit in the steering case. Position the screws (8) and tighten to 140 N·m. Check the correct assembly side of the seal (3).



**FIGURE 8:** Lubricate the unit and the steering case.



**FIGURE 9:** Fit the unit (19) in the steering case (1). Position the screws (15) and tighten securely. Check for the correct assembly side of the seal (10).

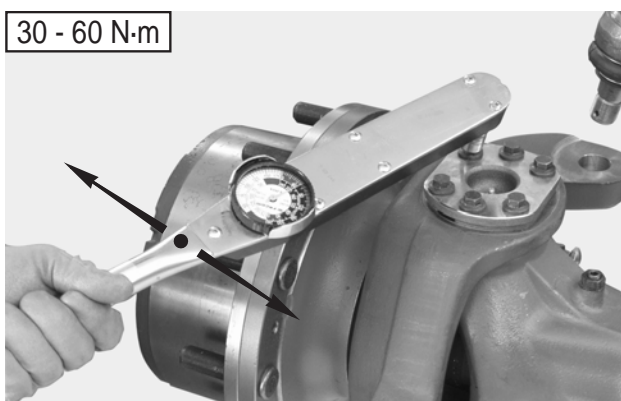


**FIGURE 10:** Tighten the new capscrews (15) of the top and bottom articulation pins in sequence using the criss-cross method. Torque wrench setting: 140 N·m

## ASSEMBLY



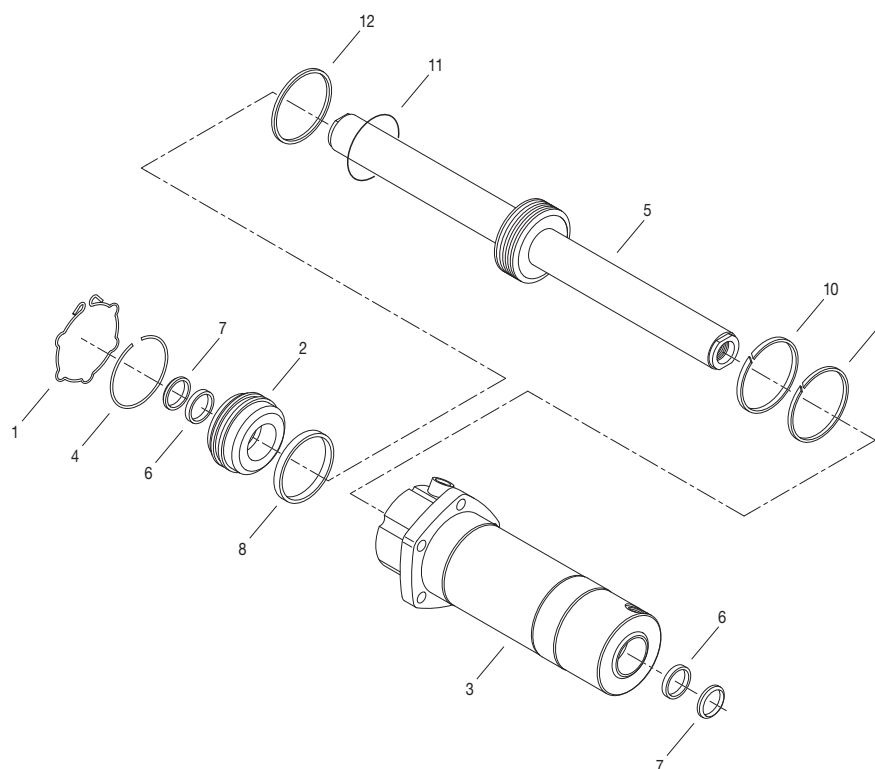
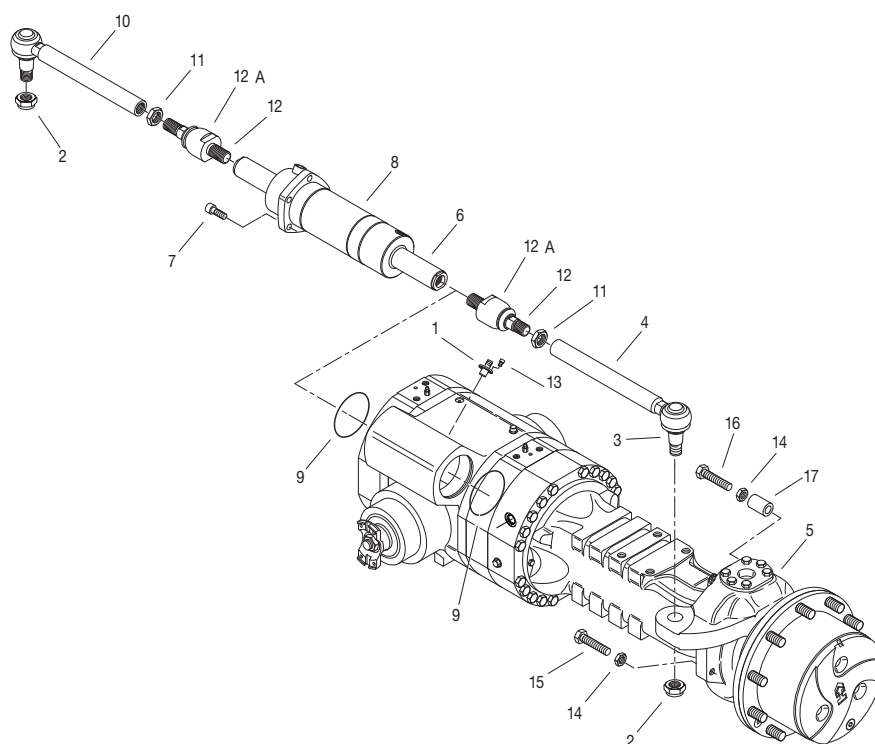
**FIGURE 11:** Using a lever, check that there is no vertical gap.



**FIGURE 12:** Check the torque of the pins, which has to be between 30 and 60 N·m.  
If the preliminary measured value is too high, the shims have to be increased.

# STEERING CYLINDER

## EXPLODED VIEW



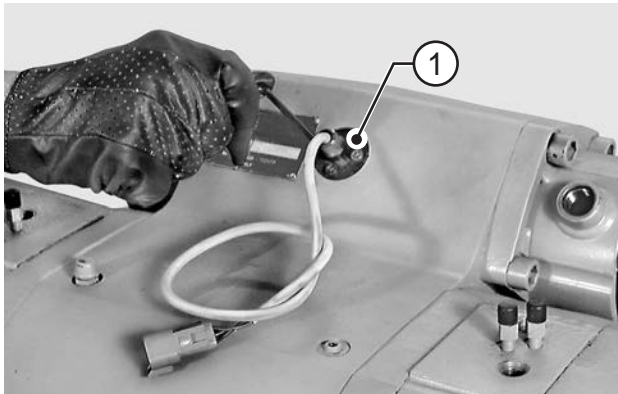


# DISASSEMBLY

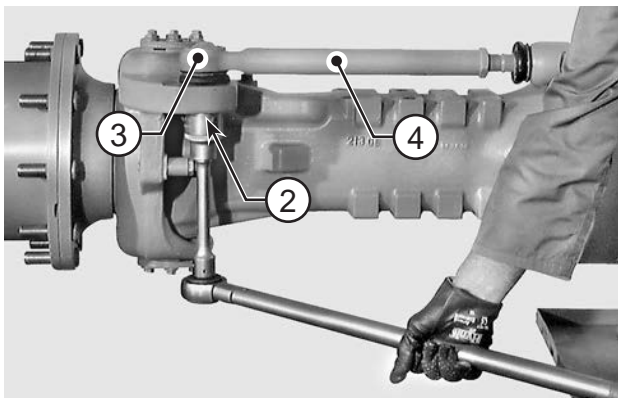
## DISASSEMBLY

### ⚠ CAUTION

Before draining oil, release the internal pressure, for details see OIL DRAINING MANDATORY PROCEDURE p. 12.



**FIGURE 1:** If required, remove the steering piston stroke centering sensor (1).



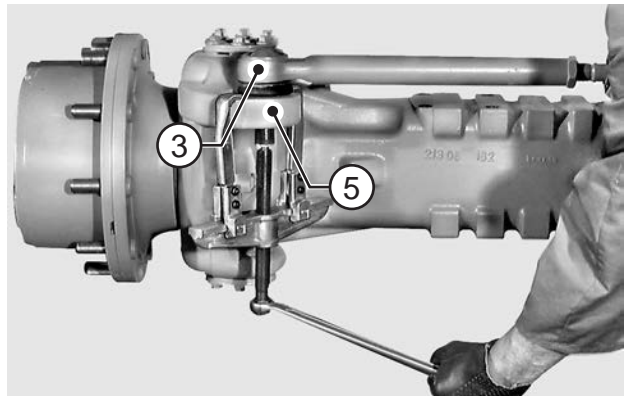
**FIGURE 2:** Loosen the check nuts (2) on the joints (3) of the steering bars (4). Remove nuts.

### NOTE:

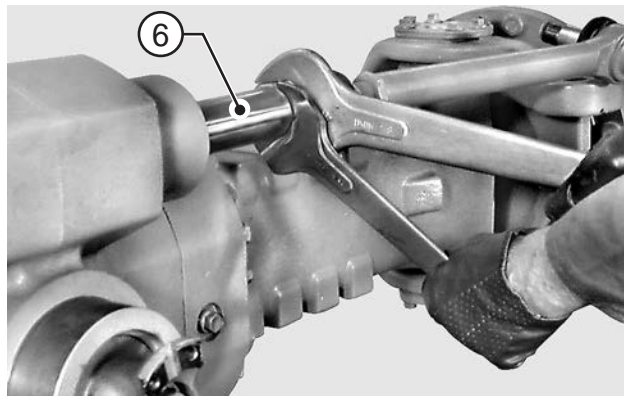
Should the joint rotate, hold it with a wrench inserted in the seat provided.

### ⚠ CAUTION

The self-locking nuts (2) must be replaced once every 5 disassemblies.



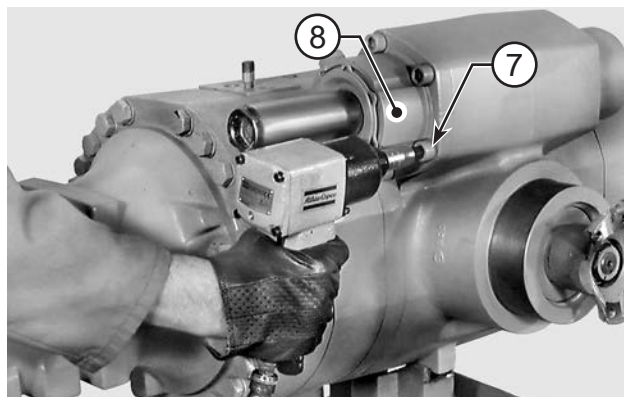
**FIGURE 3:** Using a puller, disconnect the tapered pins of the joints (3) from the steering cases (5).



**FIGURE 4:** Disconnect left and right steering bars from piston (6).

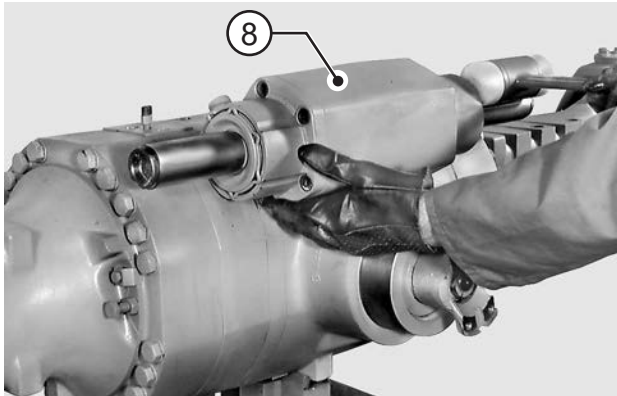
### ⚠ CAUTION

To ease bar removal, heat the threaded portion of the piston to approximately 212 °F [100 °C] with a heat gun.

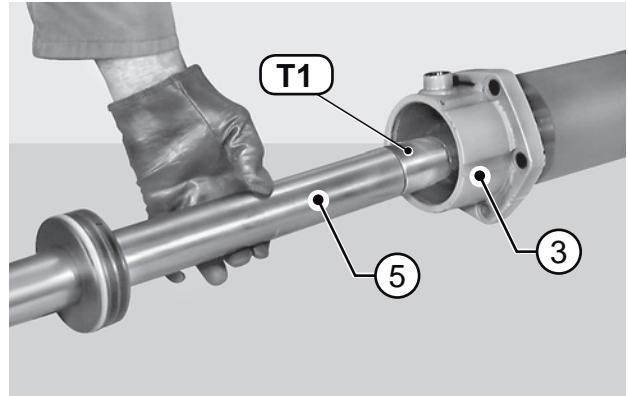


**FIGURE 5:** Loosen and remove the steering cylinder (8) screws (7).

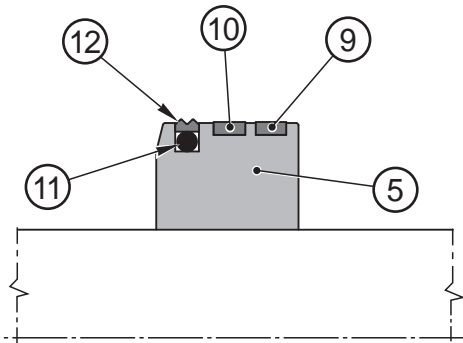




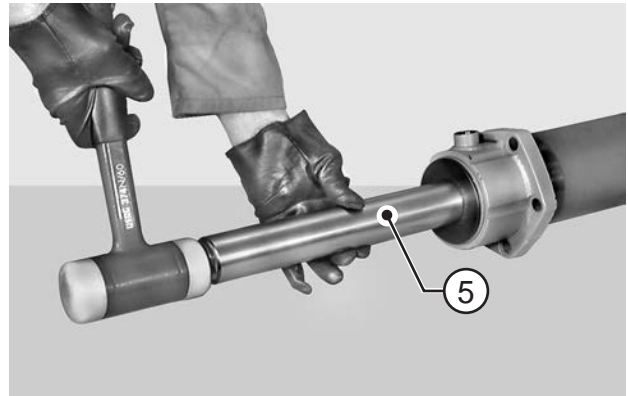
**FIGURE 6:** Extract the steering cylinder (8) using a plastic hammer.



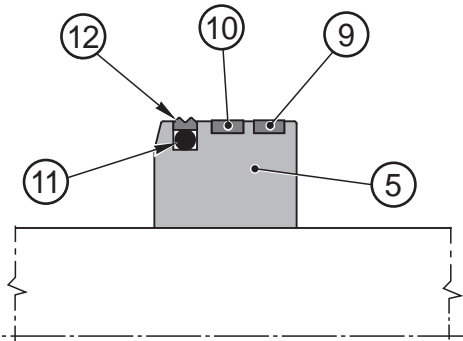
**FIGURE 9:** Using a punch, force the stop ring (4) located inside the cylinder (3) and extract ring using a screwdriver.



**FIGURE 7:** Before attempting to disassemble the unit, drain the oil in the cylinder chambers completely. Using a screwdriver, remove the snap ring (1) of the cylinder head (2).



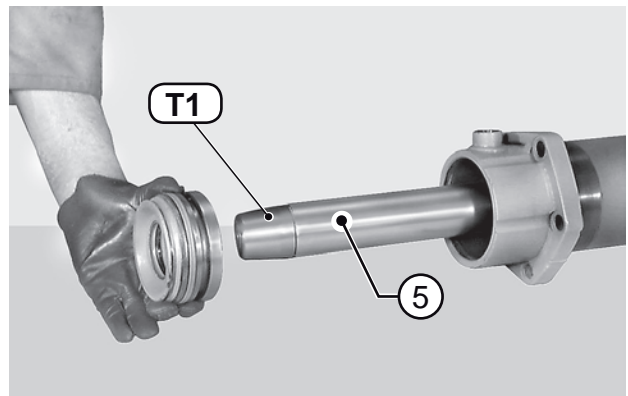
**FIGURE 10:** Using a plastic hammer, hammer the piston (5) so it strikes against the head (2). Continue until the head (2) is ejected from the cylinder (3).



**FIGURE 8:** Lightly tap the cylinder head (2) with a plastic hammer to push it inside the cylinder (3).

**NOTE:**

**Insert the cylinder head so it is flush with the cylinder.**

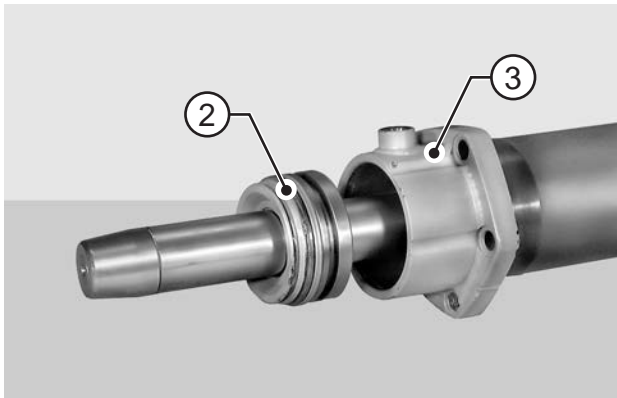


**FIGURE 11:** Take the cylinder unit (3) apart by extracting the head (2) first, followed by the piston (5).

**CAUTION**

Write down direction of installation of piston whose seal ring "A" is oriented towards cylinder head (2).

## DISASSEMBLY

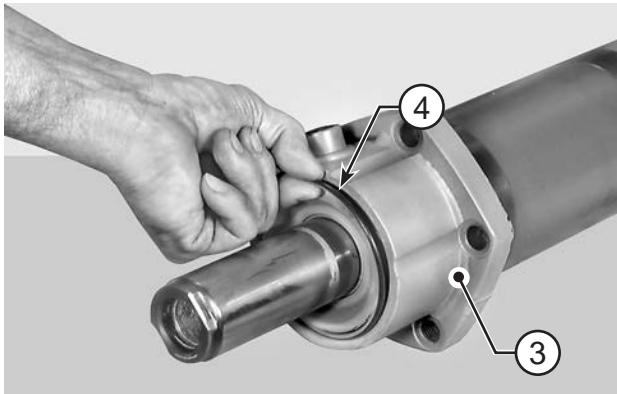


**FIGURE 12:** Remove all seals, anti-extrusion rings, and scraper rings from head (2), cylinder (3) and piston (5).

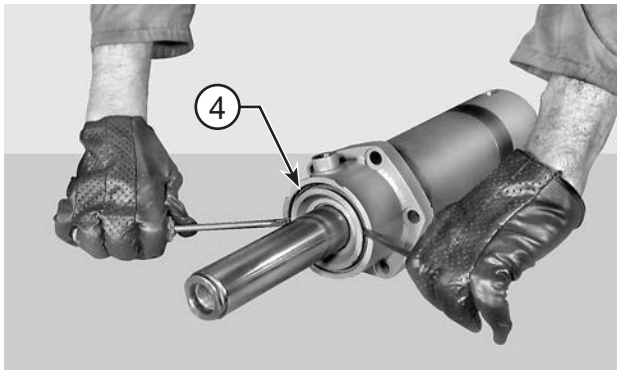
**NOTE:**

- 1 - All seals must be replaced at each disassembly.**
- 2 - Pay particular attention not to damage seal seats and piston beds.**

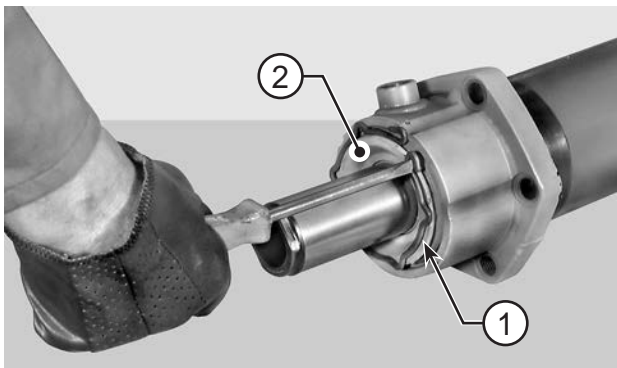
## ASSEMBLY



**FIGURE 13:** Grease and install the piston rod seal ring (6) and scraper ring (7) into cylinder (3).



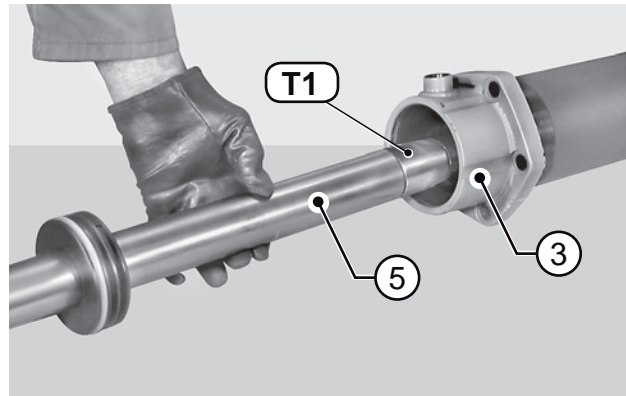
**FIGURE 14:** Grease and install the piston rod seal ring (6) and scraper ring (7) into the head (2).



**FIGURE 15:** Prepare piston (5) by fitting it with guide ring (9), magnetic ring (10), o-ring (11), and seal (12).

### ⚠ CAUTION

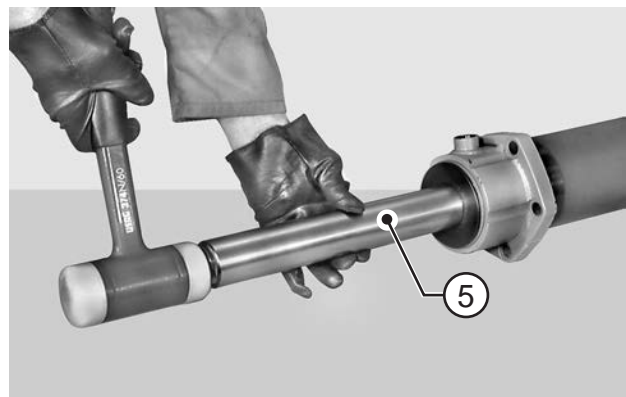
- 1 - To ease installation, lubricate with grease.
- 2 - If a centering sensor is not required, the magnetic ring (10) can be replaced with an additional guide ring (9).



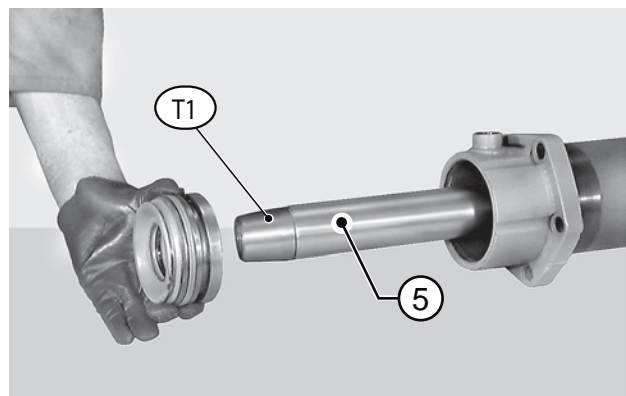
**FIGURE 16:** Apply tool T1 (See drawing T1 p. 45) to the piston rod on non-head side (2) and center rod into cylinder (3) so as to fit it into piston (5).

### NOTE:

**Lightly grease seals and cylinder.**

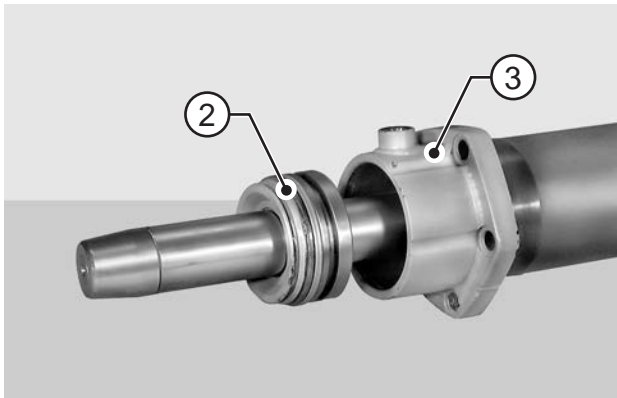


**FIGURE 17:** Introduce the piston (5) into the cylinder by approximately 150 mm using a plastic hammer.



**FIGURE 18:** Remove tool T1 (See drawing T1 p. 45) and apply it to the opposite side of the piston (5).

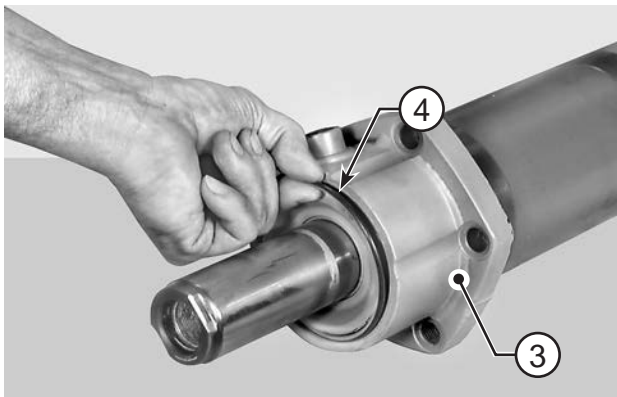
# ASSEMBLY



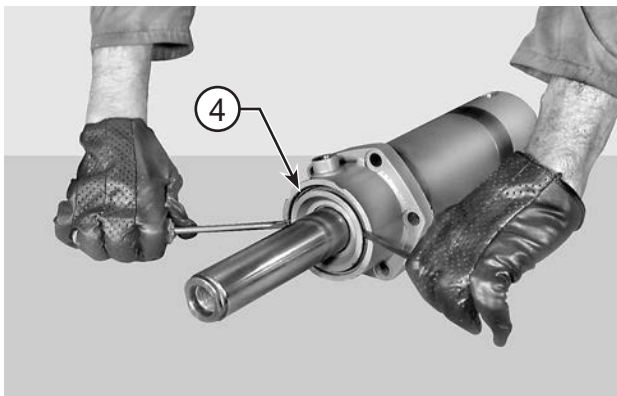
**FIGURE 19:** Grease the seals of the head (2), slip the head onto the piston and, using a plastic hammer, introduce head into cylinder (3).

## NOTE:

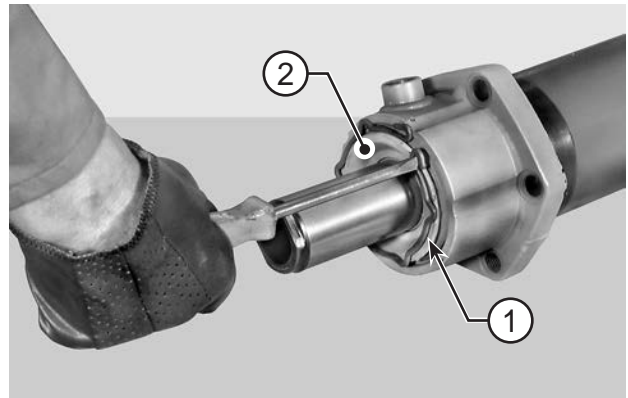
**Introduce the head so it is flush with the cylinder.**



**FIGURE 20:** Introduce the stop ring (4) and ensure that it sets in the seat of cylinder (3).



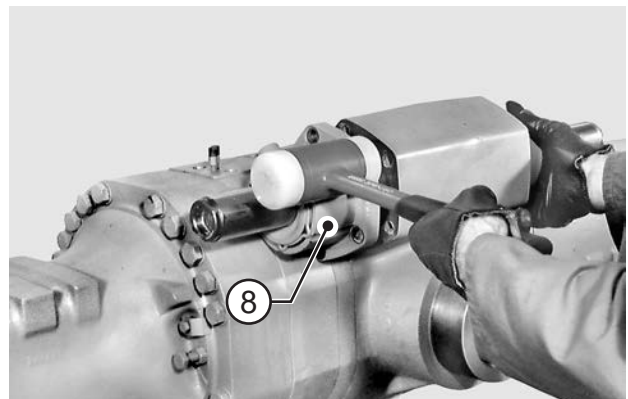
**FIGURE 21:** Using two screwdrivers or levers, force the head until it is seated against the stop ring (4).



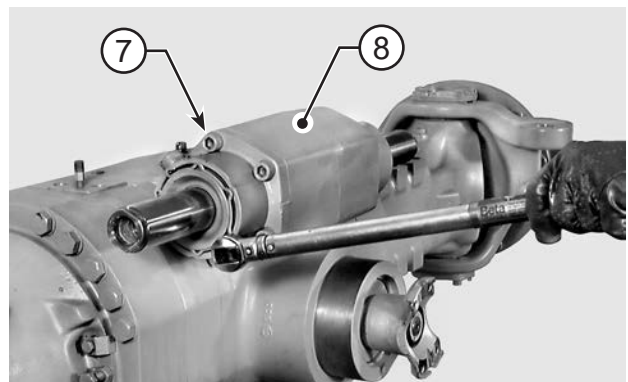
**FIGURE 22:** Fit the snap ring (1) of head (2). If necessary, force it into the seat with a punch and hammer.

## CAUTION

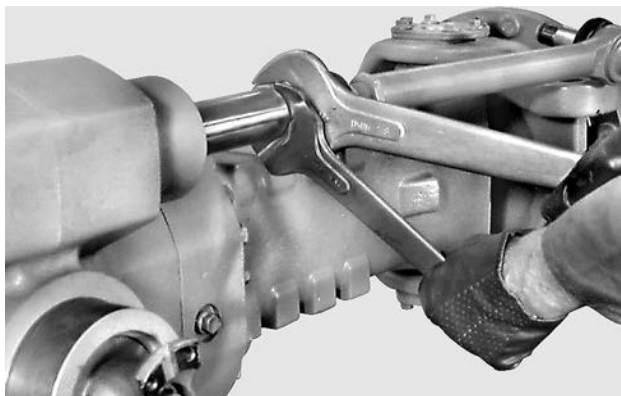
Make sure that the snap ring (1) fits snugly in its seat.



**FIGURE 23:** Check the condition of the axle unit's o-rings (9). Grease piston seats with Tecnolube Seal 101 and install cylinder using a plastic hammer.



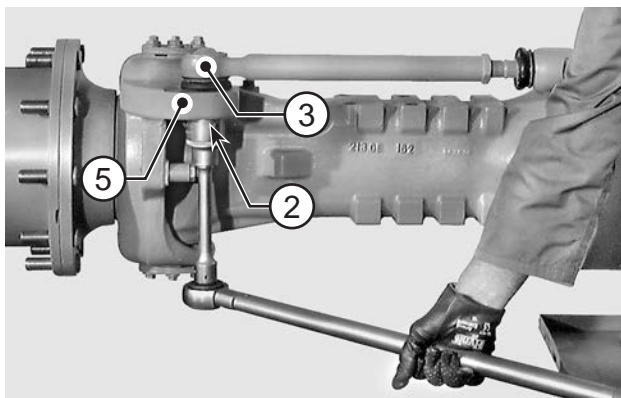
**FIGURE 24:** Block cylinder (8) with screws (7) coated with Loctite 242 and tightened to a torque of 180 - 200 N·m.



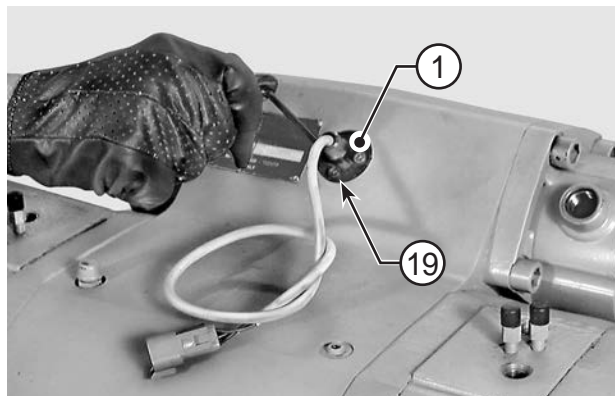
**FIGURE 25:** Apply Loctite to the threaded portion of the steering bars and connect the bars by tightening the ends in the piston rod.  
Tightening torque: 430 - 470 N·m.

## ⚠ CAUTION

Accurately remove grease from the threads using an activator before applying the thread locking compound.



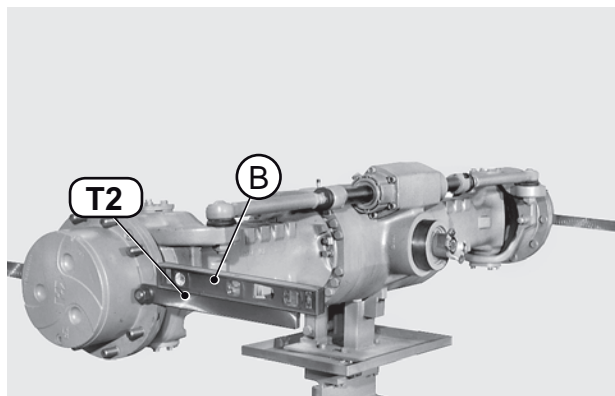
**FIGURE 26:** Introduce the pins (3) in the steering cases (5) and lock into position with nuts (2) tightened to a torque of 350 - 390 N·m.



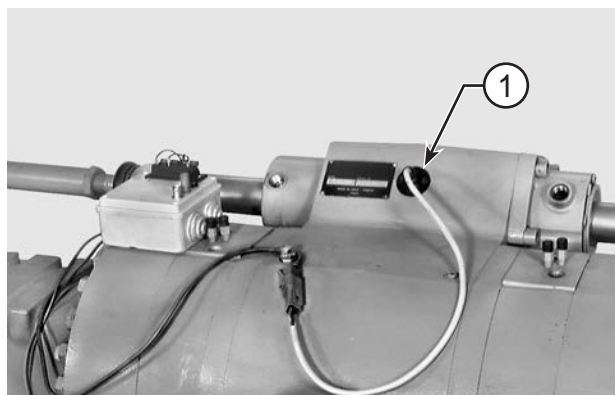
**FIGURE 27:** If required, install the steering piston stroke centering sensor (1) for checking piston centering and tighten screws (13). Tightening torque: 5 - 6 N·m

## ⚠ CAUTION

If required, eliminate the action of the negative brake.



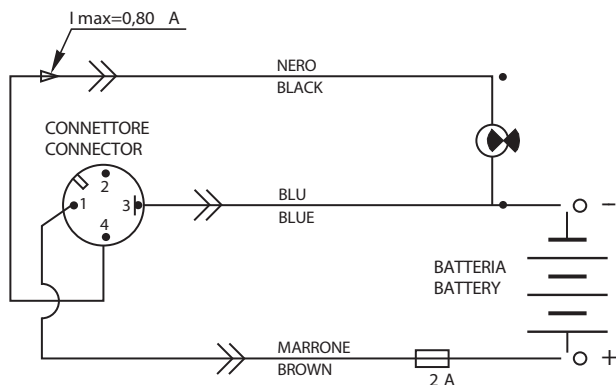
**FIGURE 28:** Apply tools T2 (See drawing T2 p. 45) onto the wheel hubs and lock tools. Check that tools are perfectly flat and parallel to each other using a level "B".



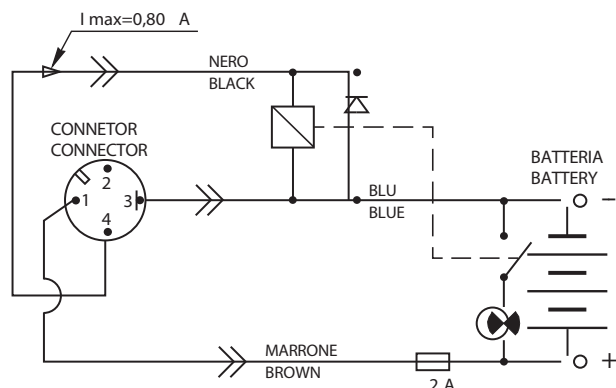
**FIGURE 29:** Connect the sensor (1) to the control device according to either of the following diagrams.



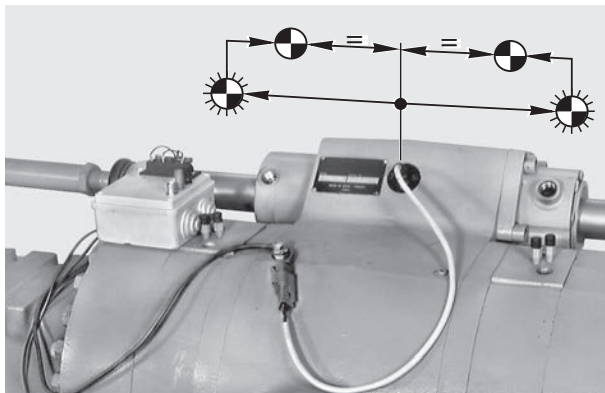
# ASSEMBLY



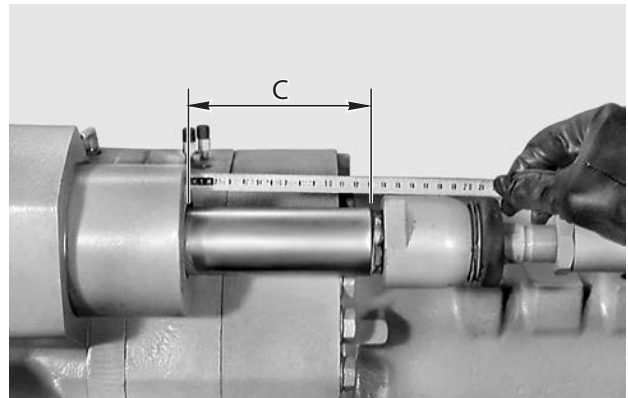
**FIGURE 30:** Sensor wiring diagram for STANDARD version.



**FIGURE 31:** Sensor wiring diagram for OPTIONAL version.



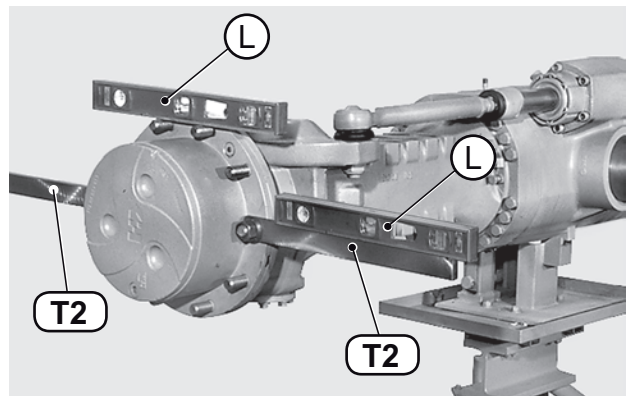
**FIGURE 32:** Center by slowly moving the piston first in one direction, then in the opposite one, position the piston in the middle point of the stroke, which is determined by the control device signalling lamp turning on and switching off in the reverse stage.



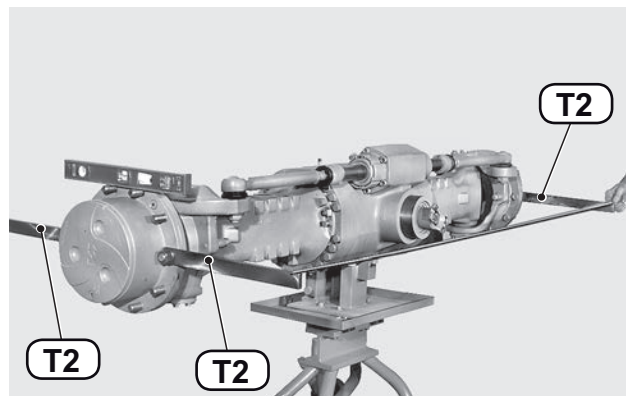
**FIGURE 33:** Check distance "C" of piston on either of the two sides and write down distance dimension to check subsequent adjustments.

## NOTE:

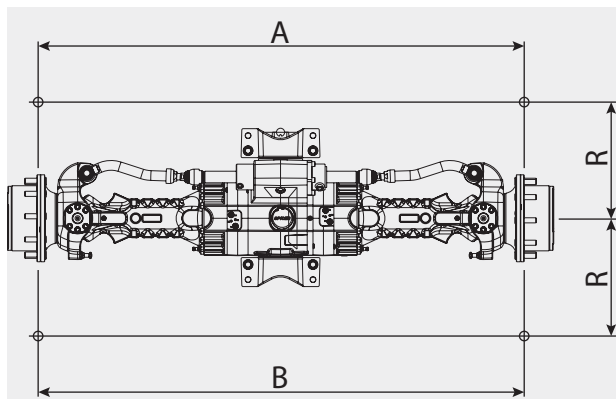
**For cylinders without sensors, piston must be centered based on maximum stroke.**



**FIGURE 34:** Lay level "L" on two upper studs and line them up. Apply tools T2 (See drawing T2 p. 45) to the two horizontal studs; hold them in position with two nuts, level them, and finally lock into position.

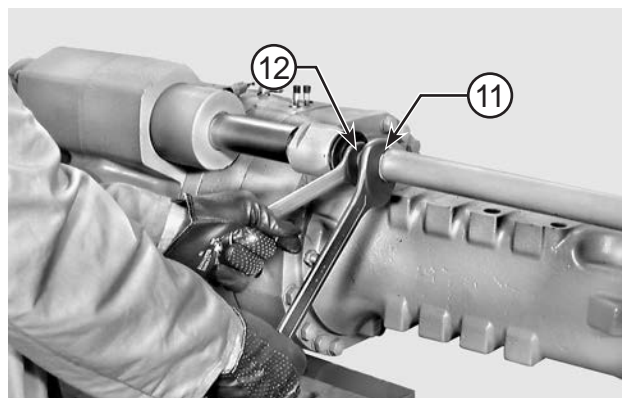


**FIGURE 35:** Without moving the piston, check front "B" and rear "A" using tool T1 (See drawing T2 p. 45) at "R" value. R = 400 mm (see picture below).



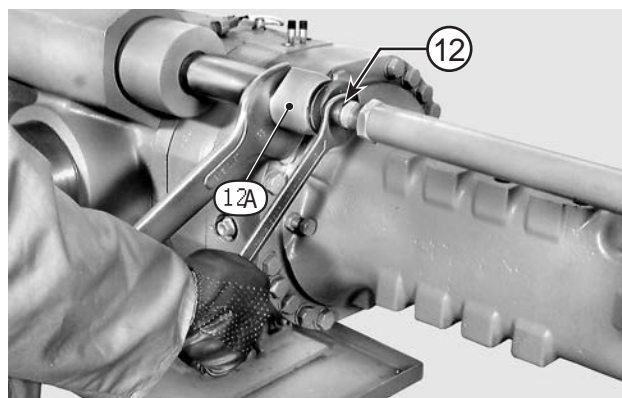
**FIGURE 36:** Adjust the convergence with a difference between "A" and "B" of maximum 2,5 mm.

$A \pm B = 2,5 \text{ mm}$   
 $R = 400 \text{ mm}$



**FIGURE 37: TOE-IN**

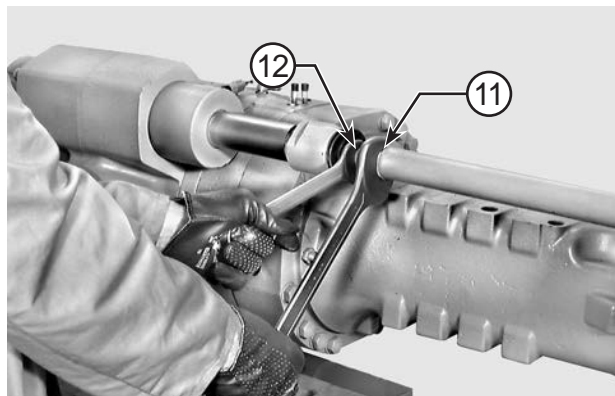
If necessary, adjust alignment after loosening the check nuts (11) of ball pins (12).



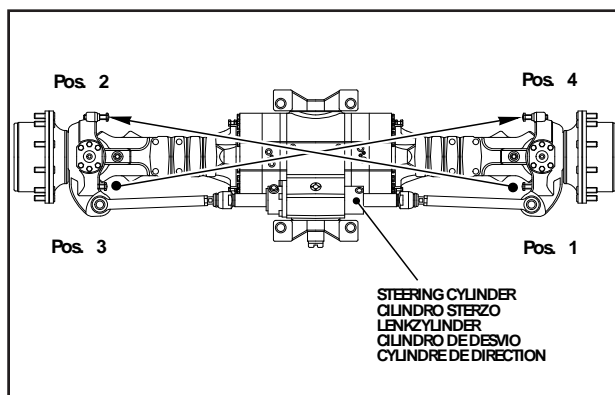
**FIGURE 38:** Hold joints (12A) tight and rotate the ball pins (12) until tools T2 (See drawing T2 p. 45) become parallel to each other.

**NOTE:**

- 1 - Loosen the nuts by a few turns.
- 2 - Half a turn of the pin will reduce the front stud by about 3 mm and increase the rear one by about 3 mm.



**FIGURE 39:** Once toe-in has been adjusted, lock nuts (11). Tightening torque for nuts: 328 - 363 N·m.



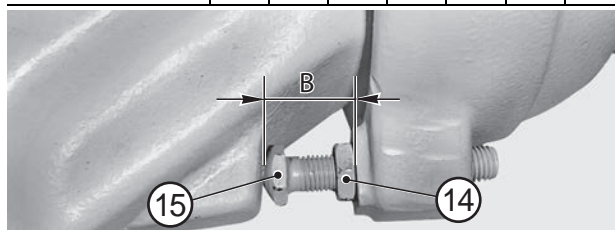
**FIGURE 40: ADJUSTING THE STEERING ANGLE**

Loosen the nut of one of the adjusting screws on cylinder side.

**NOTE:**

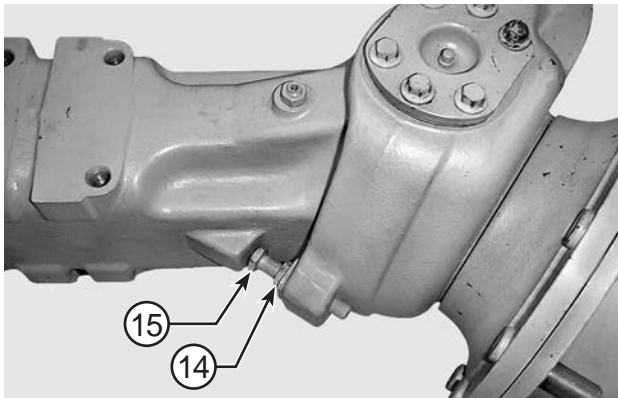
Perform the same operations on both sides (see diagram).

STEERING ANGLE - ANGOLO DI STERZATURA - EINSCHLAGWINKEL - ANGULACION DE DESVIO - ANGLE DE BRAQUAGE	43°	45°	35°	55°	40°	50°	
DISTANCE - DISTANZA - ABSTAND - DISTANCIA - DISTANCE	"B" (mm)	58.5	53.5	51.6	23.8	36.6	38.2

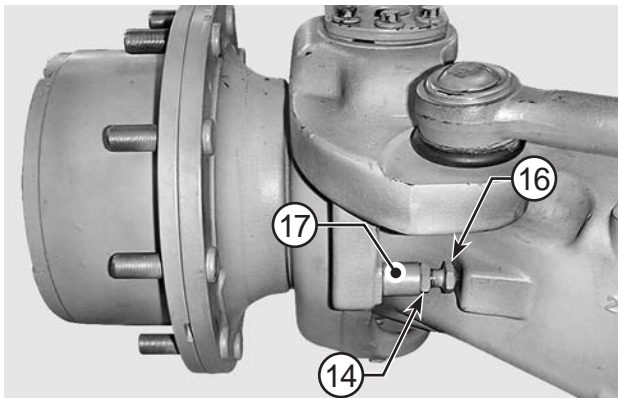


**FIGURE 41:** Adjust the jutting portion of the screw (15) according to data shown in the table. Lock into position with nut (14) tightened to 145 - 148 N·m.

## ASSEMBLY



**FIGURE 42:** Perform one full steering operation until the adjusted screw (15) leans against the arm stop.



**FIGURE 43:** While holding the adjustment screw in position against the arm stop, adjust the screw opposite (16), on non-cylinder side, until it leans against the arm stop.

### CAUTION

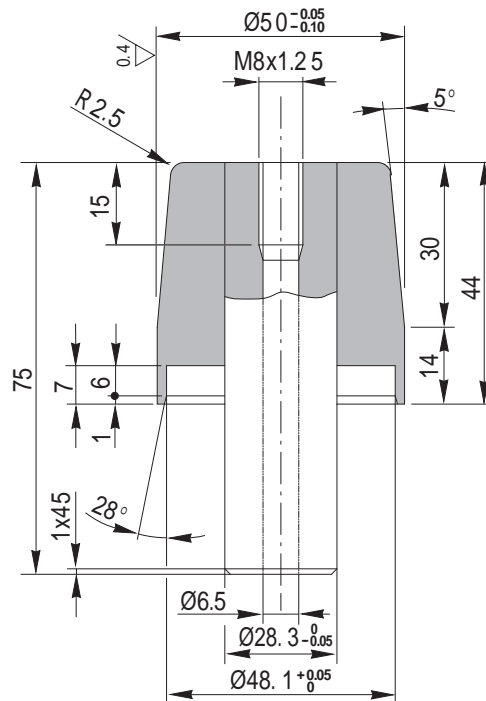
The screws (15) and (16) must lean against the respective arm stops all at the same time.



## SPECIAL TOOLS

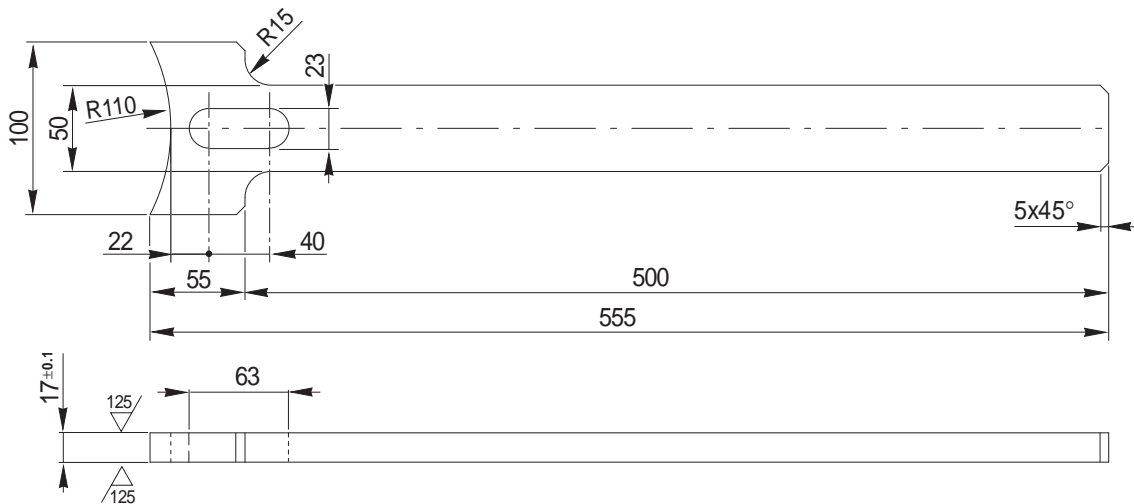
T1

P/N: 2368



T2

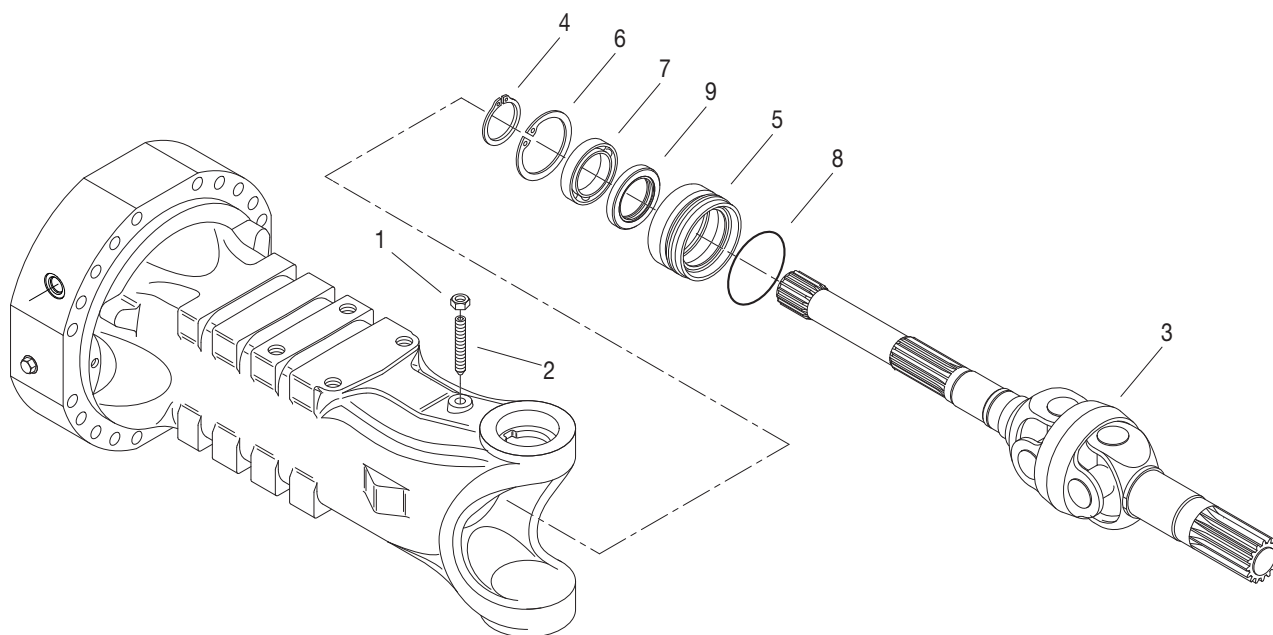
P/N: 2367





# U-JOINT

## EXPLODED VIEW

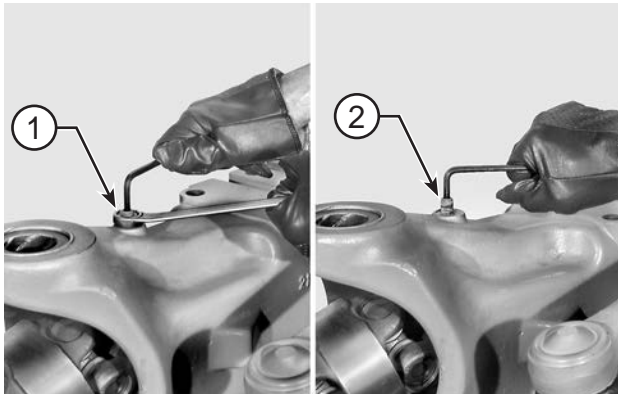


# DISASSEMBLY

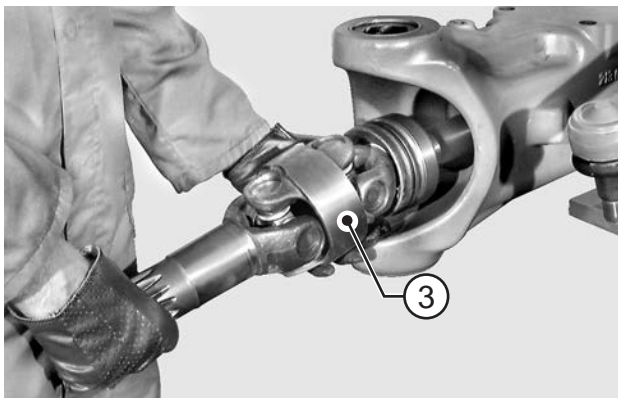
## DISASSEMBLY

### ⚠ CAUTION

Before draining oil, release the internal pressure, for details see OIL DRAINING MANDATORY PROCEDURE p. 12.



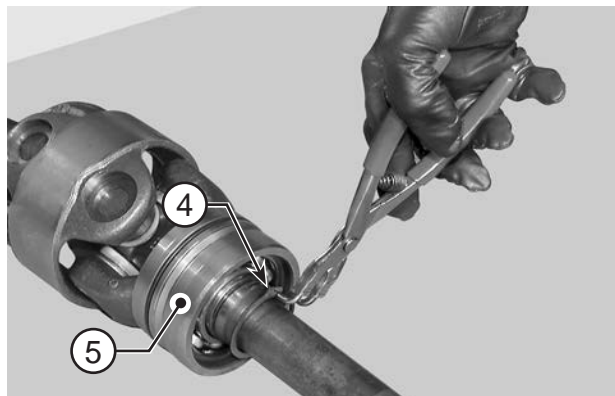
**FIGURE 1:** Loosen and remove the check nut (1) of the stud (2). Remove stud (2).



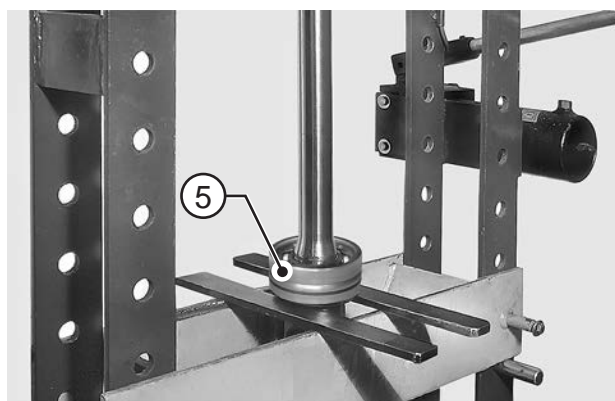
**FIGURE 2:** Extract the whole twin u-joint (3).

#### **NOTE:**

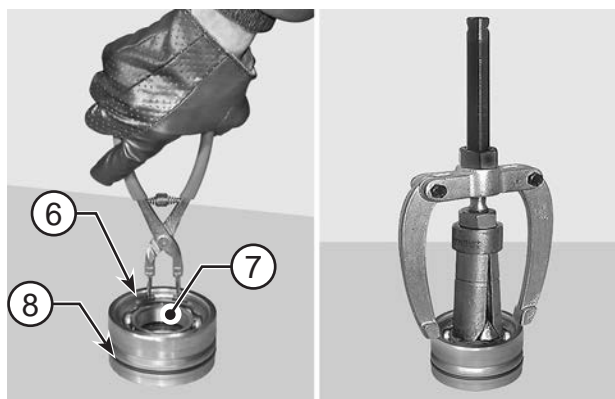
If necessary, use a plastic hammer or lever to ease extraction of the twin u-joint.



**FIGURE 3:** Remove the snap ring (4) of the bushing kit (5).



**FIGURE 4:** Place the u-joint under a press and remove the complete bushing (5).

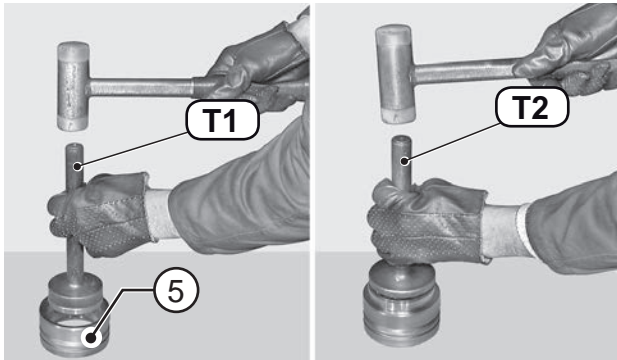


**FIGURE 5:** Remove the bearing (7) snap ring (6). Remove the o-ring (8) and, using a puller for inner parts, remove the bearing (7) and seal ring (9).

#### **NOTE:**

Write down direction of installation of seal ring.

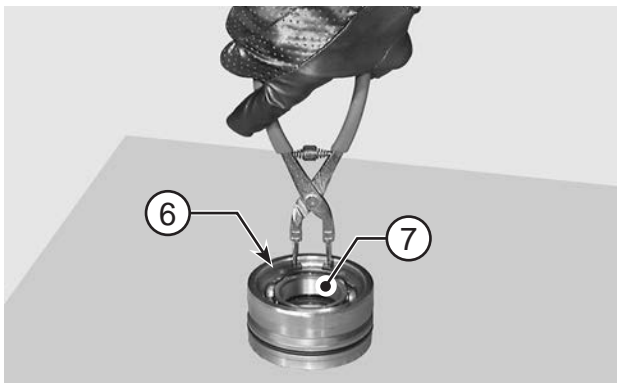
## ASSEMBLY



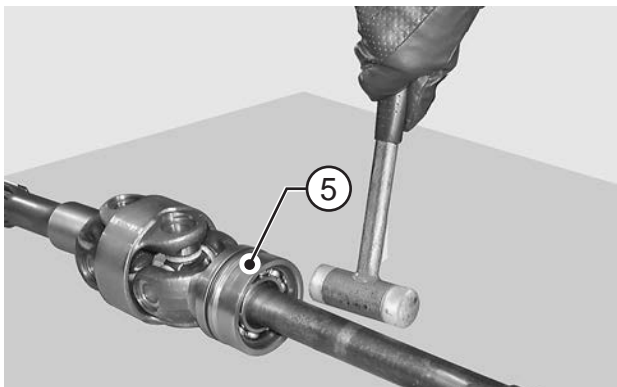
**FIGURE 6:** Using tools T1 (See drawing T1 p. 50) and T2 (See drawing T2 p. 50), introduce the seal ring (9) and bearing (7) into the bushing (5).

### **NOTE:**

**Check direction of installation of seal (9) carefully.**



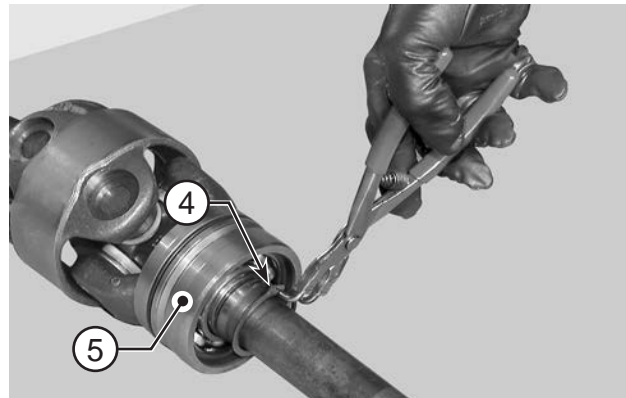
**FIGURE 7:** Install the bearing (7) snap ring (6).



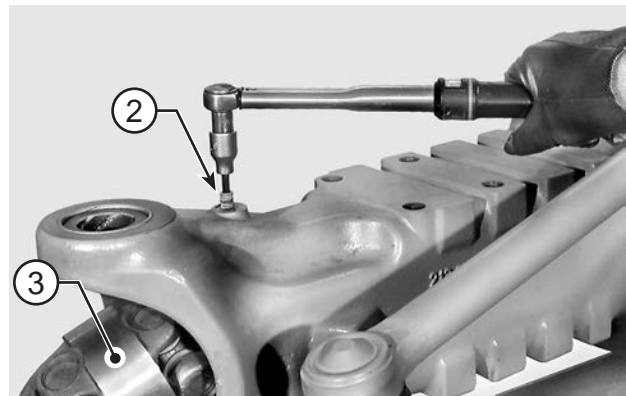
**FIGURE 8:** Install the complete bushing (5) onto the twin u-joint and set bushing into position with a plastic hammer.

### **CAUTION**

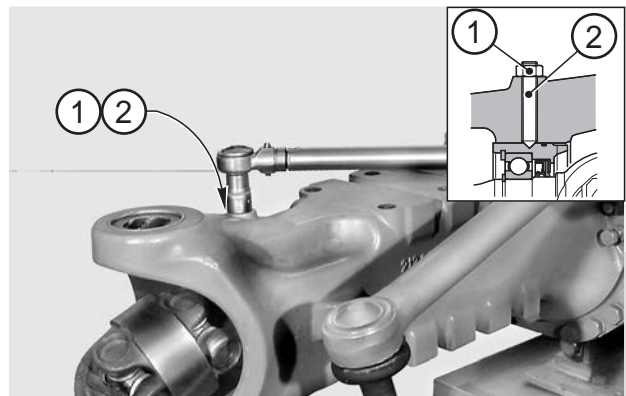
Tap around the whole rim.



**FIGURE 9:** Install the bushing (5) snap ring (4); position the o-ring (8) as well.



**FIGURE 10:** Introduce the twin U-joint (3) into the arm and lock into position with stud (2) coated with Loctite 242. Tighten stud to a maximum torque of 15 N·m.



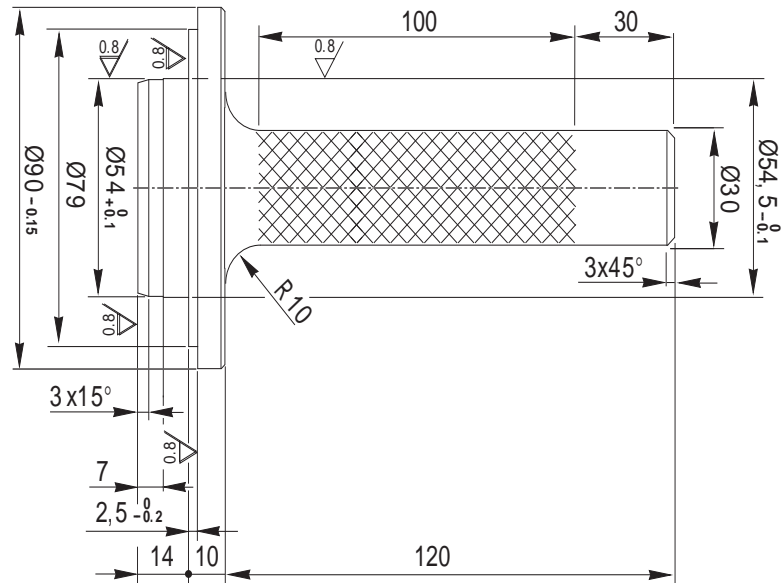
**FIGURE 11:** Apply Loctite 242 to the jutting portion of the stud (2) and tighten nut (1). Tighten nut (1) to a torque of 60 - 70 N·m while holding stud (2) in position.

## SPECIAL TOOLS

## SPECIAL TOOLS

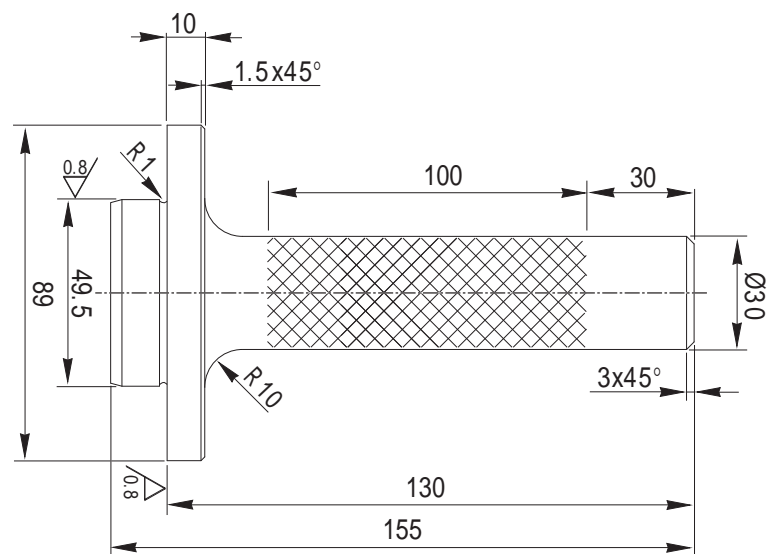
**T1**

**P/N: 3342**



## T2

**P/N: 2301**

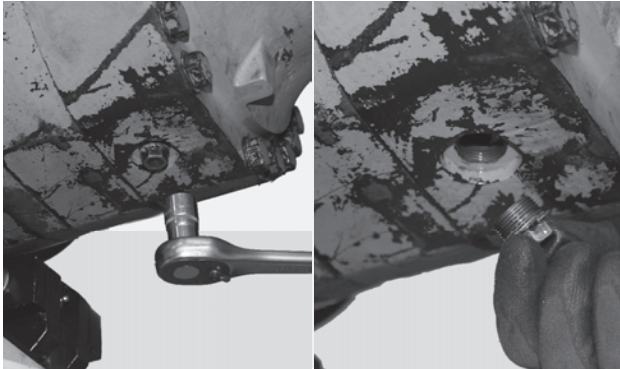


# BRAKE WEAR CHECK PROCEDURE

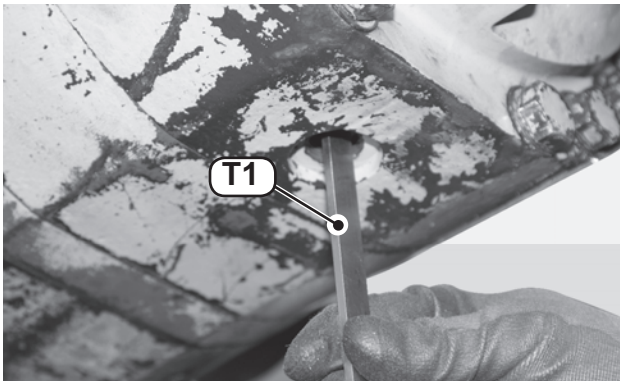
## OLD VERSION

### CAUTION

Perform all operations on both arms.



**FIGURE 1:** Remove the oil drain plug and discharge oil.

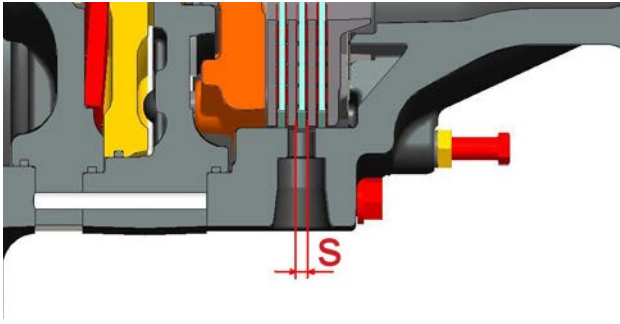


**FIGURE 2:** Apply the parking brake (or have someone hold the service brake) and with either brake applied, check the distance between discs using tool T1 (See drawing T1 p. 54). Minimum distance: 5,2 mm

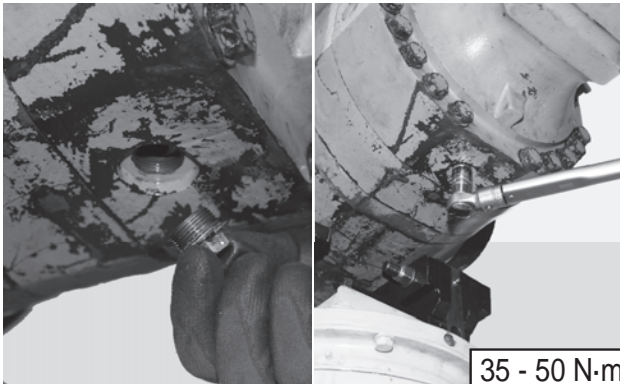
### CAUTION

Replace the braking disks and the intermediate disks on both sides if necessary. See SERVICE BRAKE AND NEGATIVE PARKING BRAKE p. 55.

## SPECIAL TOOLS



**FIGURE 3:** Checking brake distance with the T1 go / no-go gauge.



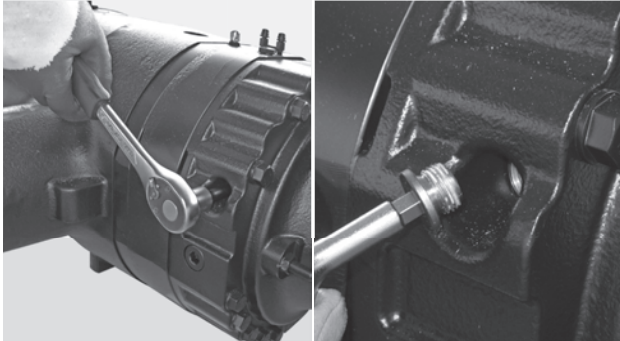
**FIGURE 4:** Install the oil drain plug.  
Torque wrench setting for screws: 35 - 50 N·m.  
Fill with oil.



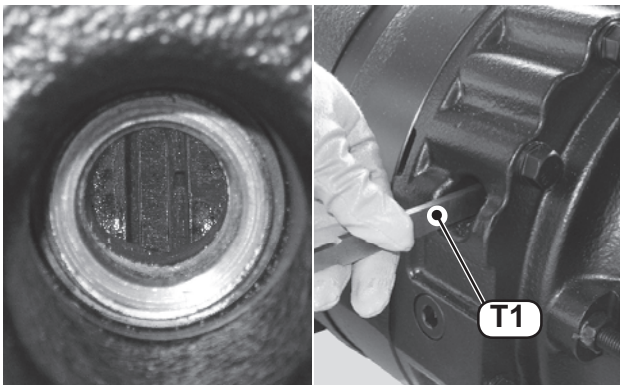
## NEW VERSION

### ⚠ CAUTION

Perform all operations on both arms.



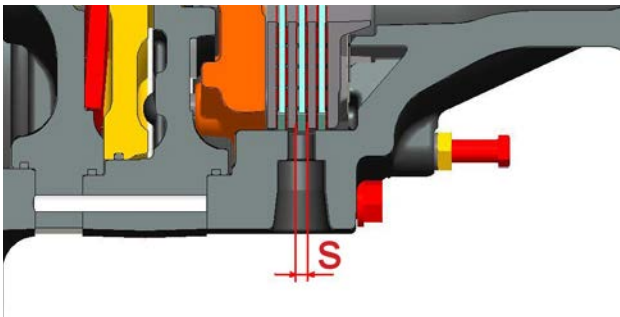
**FIGURE 1:** Remove the inspection plug.



**FIGURE 2:** Apply the parking brake (or have someone hold the service brake) and with either brake applied, check the distance between discs using tool T1 (See drawing T1 p. 54). Minimum distance: 5,2 mm

### ⚠ CAUTION

Replace the braking disks and the intermediate disks on both sides if necessary. See SERVICE BRAKE AND NEGATIVE PARKING BRAKE p. 55.



**FIGURE 3:** Checking brake distance with the T1 go / no-go gauge.

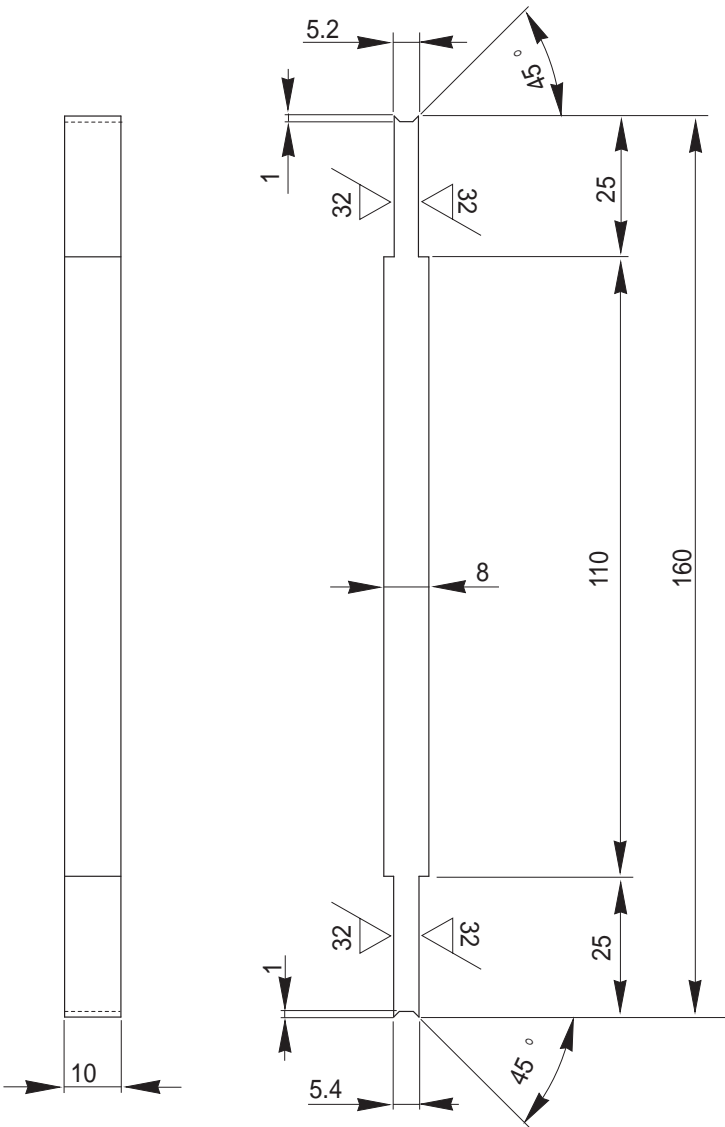


**FIGURE 4:** Install the inspection plug.  
Torque wrench setting for screws: 35 - 50 N·m.

## SPECIAL TOOLS

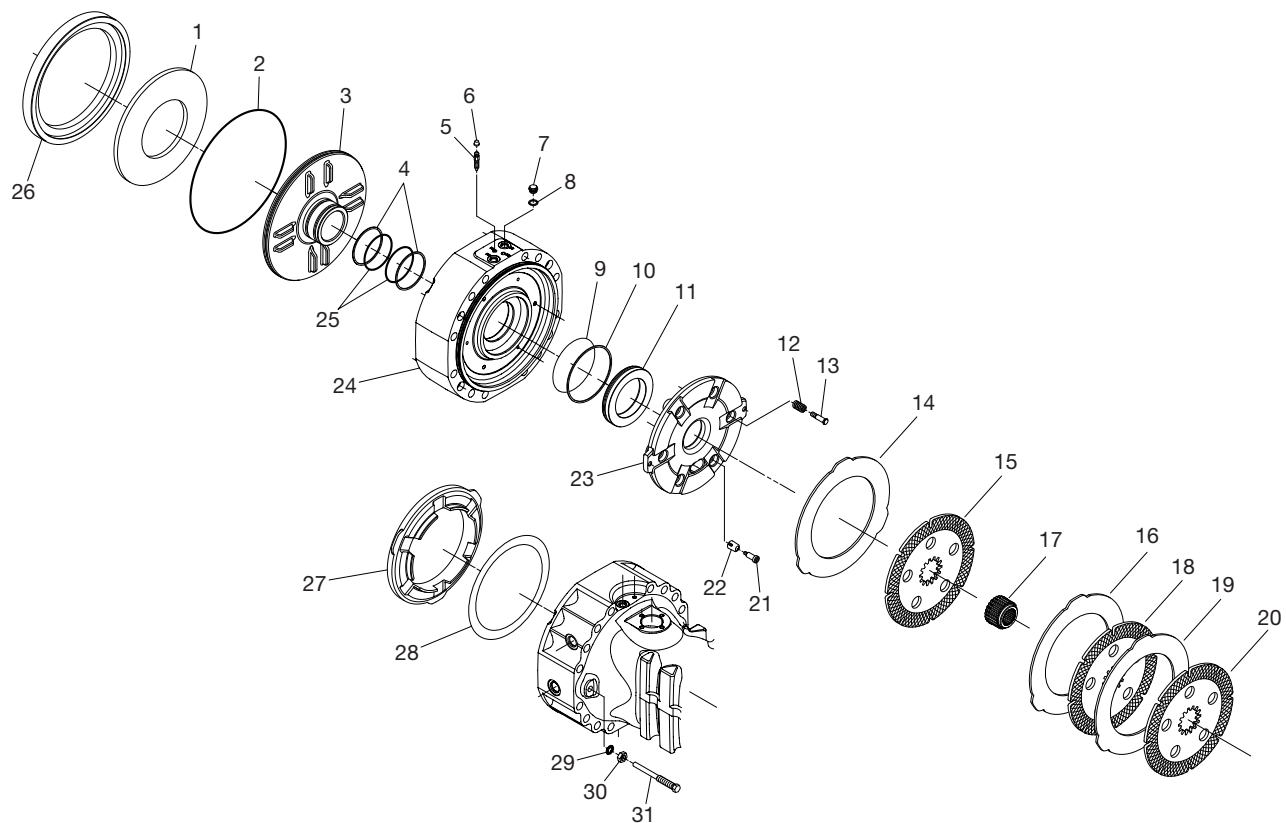
## SPECIAL TOOLS

**T1**



## SERVICE BRAKE AND NEGATIVE PARKING BRAKE

### EXPLODED VIEW



# DISASSEMBLY

## DISASSEMBLY

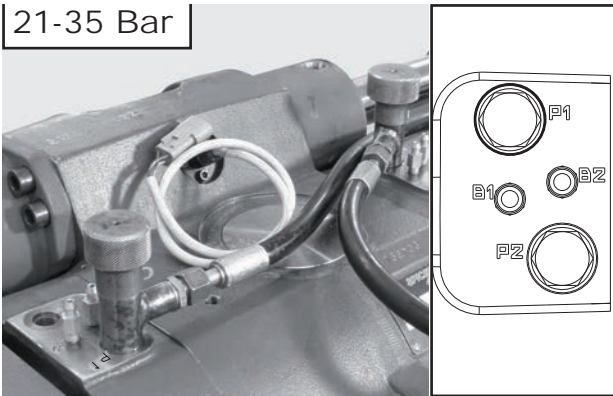
### DANGER

Before maintaining brakes, when the axle is installed on the vehicle, follow all safety instructions in the Original Equipment Manufacturer (OEM) manual that came with the vehicle.

### CAUTION

Before draining oil, release the internal pressure, for details see OIL DRAINING MANDATORY PROCEDURE p. 12.

21-35 Bar

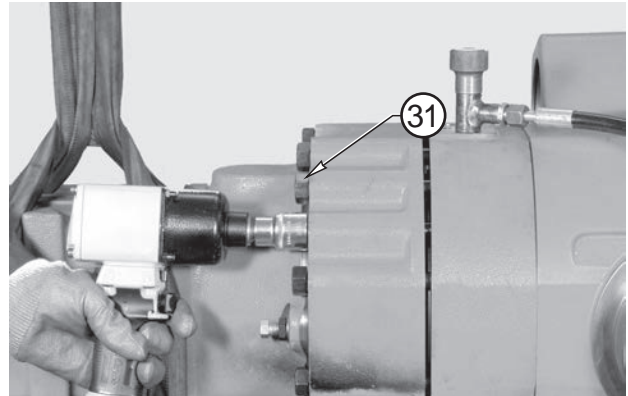


**FIGURE 1:** Connect an external pump to the union piece “P1” of the negative brake and introduce a pressure of 21 - 35 bar to eliminate the pressure of the Belleville washers (1).

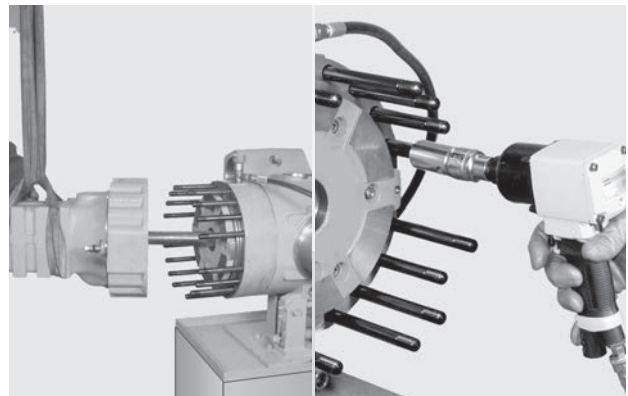
### DANGER

Always check that the hydraulic circuit test for leaks under pressure. Always use a cardboard or a panel to control the loss.

A leak from a hole of the size of a pin can cause serious injury. If fluid is injected into the skin it is necessary to seek immediate medical care.



**FIGURE 2:** Sling the arm to be removed and connect it to a hoist. Loosen and remove screws (31).



**FIGURE 3:** Remove arm together with brakes and axle shafts; lay down the arm vertically.

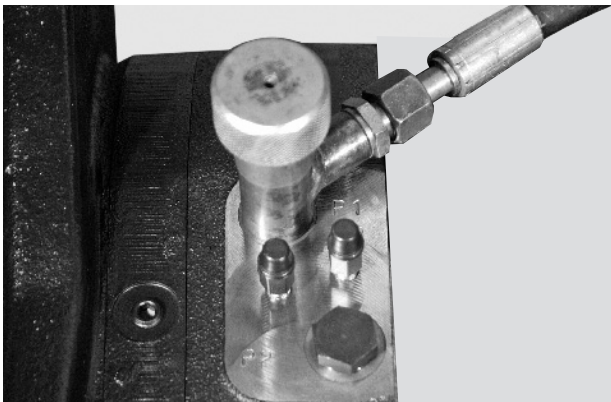


**FIGURE 4:** Gradually release the pressure in the braking circuit, bringing it to zero through the external pump.

## **DANGER**

Do not remove any part of the hydraulic circuit without having completely released the hydraulic pressure.

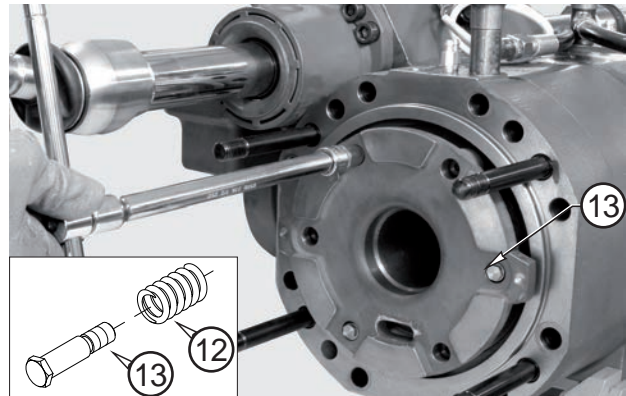
The removal of pressurized parts or loss caused from releasing these components can cause serious injuries and even death. A leak from a hole of the size of a pin can cause serious injury. If fluid is injected into the skin it is necessary to seek immediate medical care.



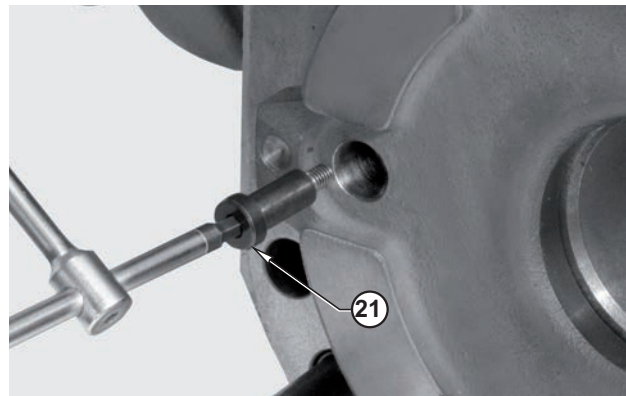
**FIGURE 5:** Gradually loosen the sleeve and remove.

## **DANGER**

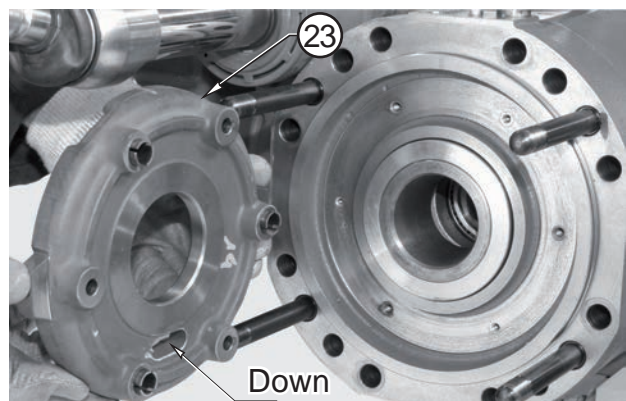
Carefully check that the hydraulic pressure is discharged completely before removing the external pump sleeve connected to the brake.



**FIGURE 6:** Remove the adjusting screws (13) from the counterwasher (23).



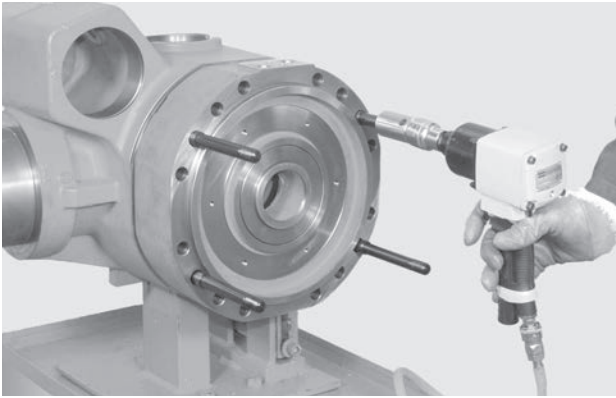
**FIGURE 7:** Remove the pin screws (21).



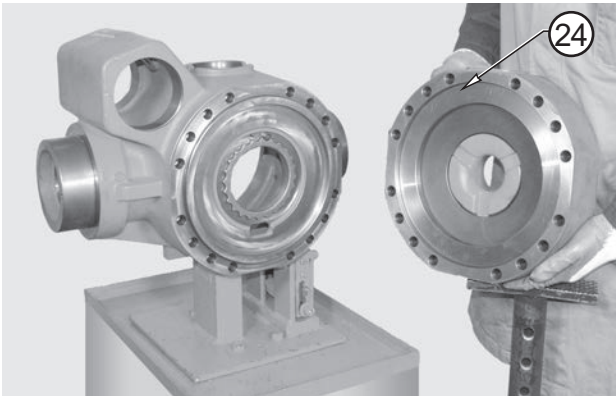
**FIGURE 8:** Write down their order of assembly and remove the counterwasher (23).



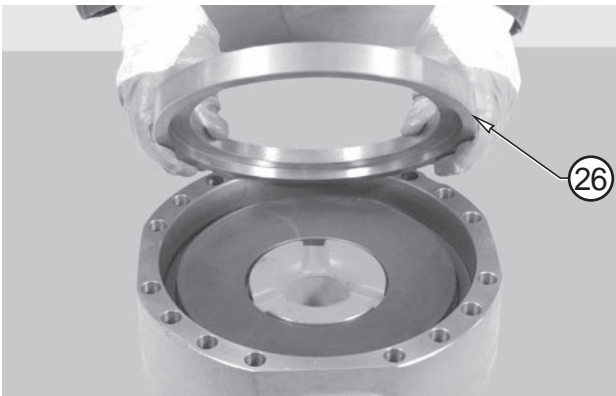
# DISASSEMBLY



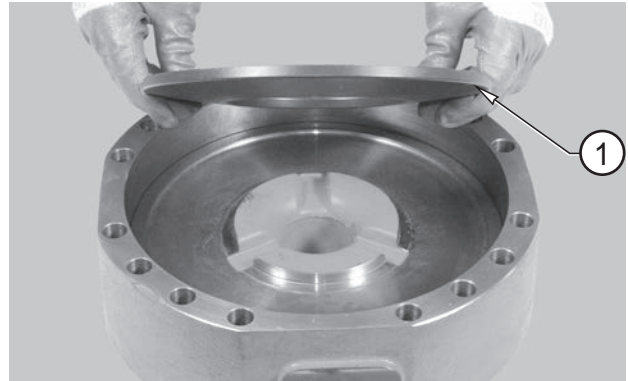
**FIGURE 9:** Loosen the studs in an alternate method and remove them.



**FIGURE 10:** Remove the cylinder (24).



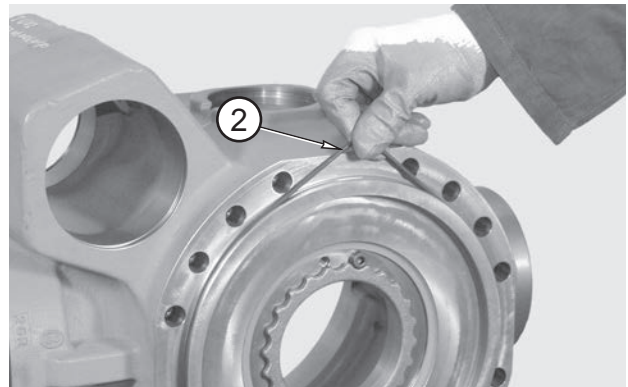
**FIGURE 11:** Remove the centering device (26) in the cylinder.



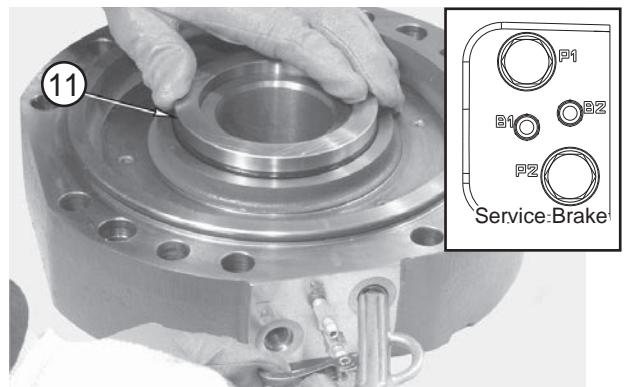
**FIGURE 12:** Remove the Belleville washers (1).

## **NOTE:**

**Check the sense of direction of washers (1).**



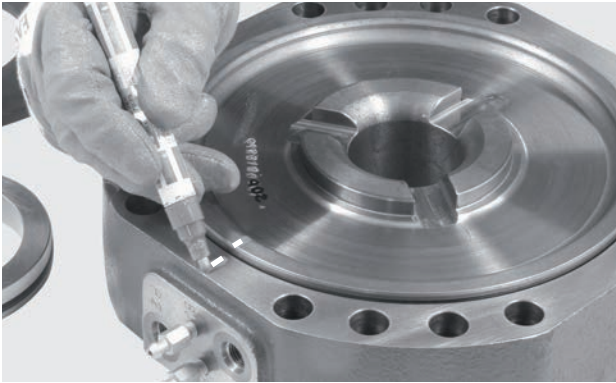
**FIGURE 13:** The O-rings (2) must be replaced each time the unit is disassembled.



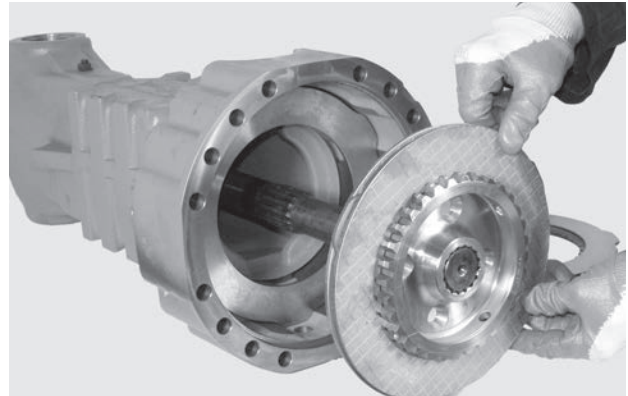
**FIGURE 14:** Slowly introduce low-pressure compressed air through the connection member for the service brake (P2), in order to extract the piston (11).

## **CAUTION**

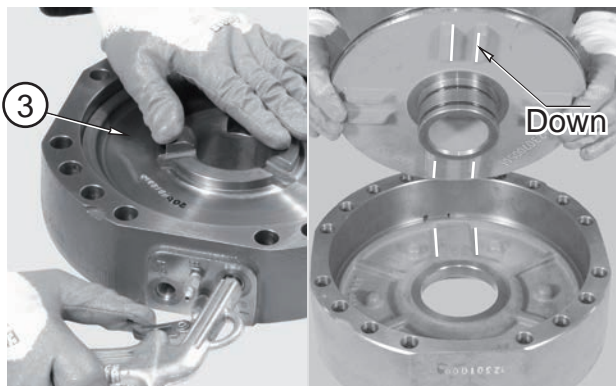
Hold the piston (11) back, as it may be suddenly ejected and damaged.



**FIGURE 15:** Mark the assembly position.



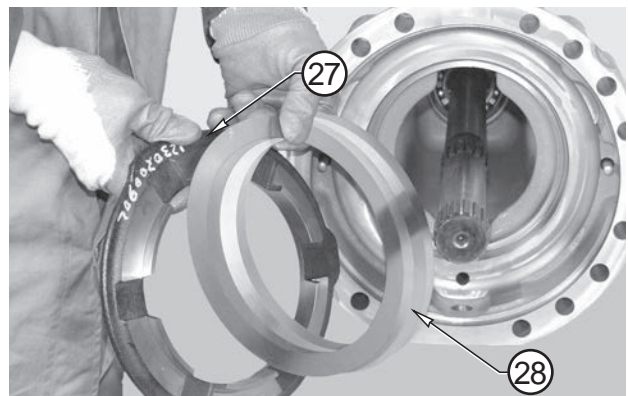
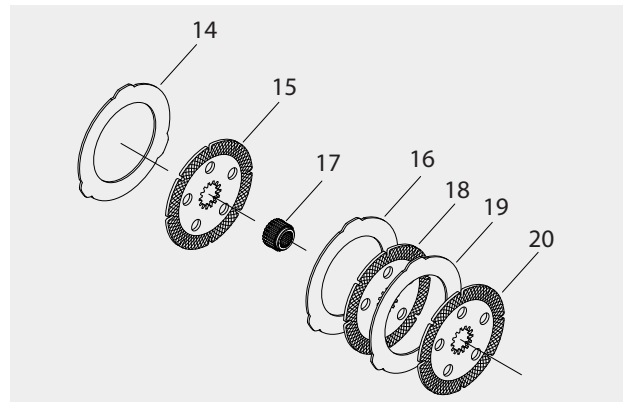
**FIGURE 18:** Remove the flange (17) complete with the discs (20, 19, 18).



**FIGURE 16:** Slowly introduce low-pressure compressed air through the connection member for the service brake (P1), in order to extract the piston (3).

## ⚠ CAUTION

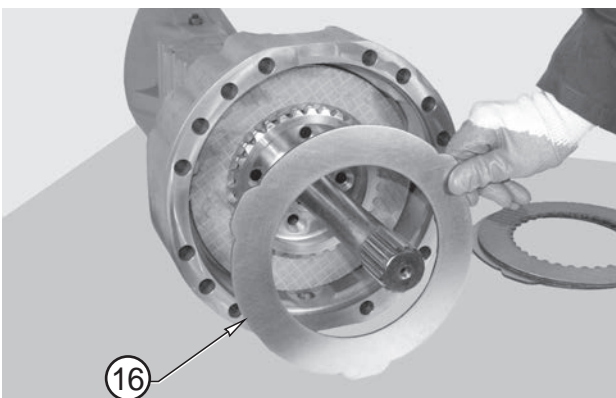
Hold the piston (3) back, as it may be suddenly ejected and damaged.



**FIGURE 19:** Remove spacer-braking discs (27) and shims (28), noting down direction of assembly.

## NOTE:

**Build a stack of washers and check the measurement.**



**FIGURE 17:** Remove braking discs (14, 15, 16), noting down direction of assembly.

## NOTE:

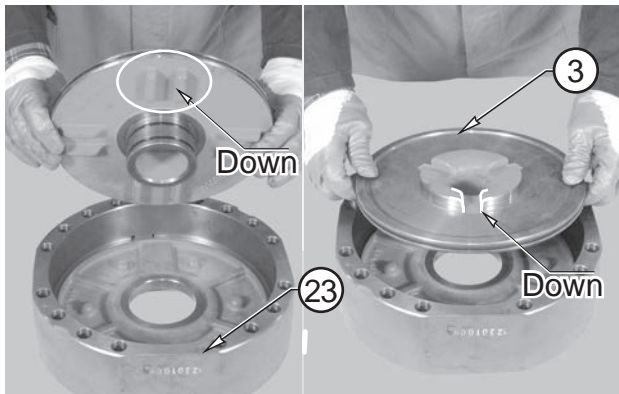
**If disks are not being replaced, avoid changing their position.**

# ASSEMBLY

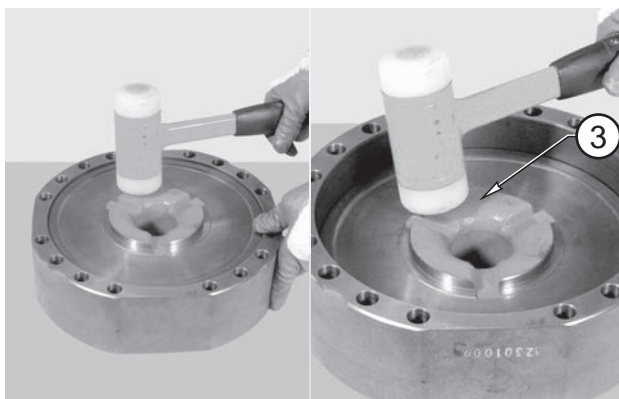
## ASSEMBLY

### ⚠ CAUTION

The o-rings always have to be assembled from the pressure facing side.



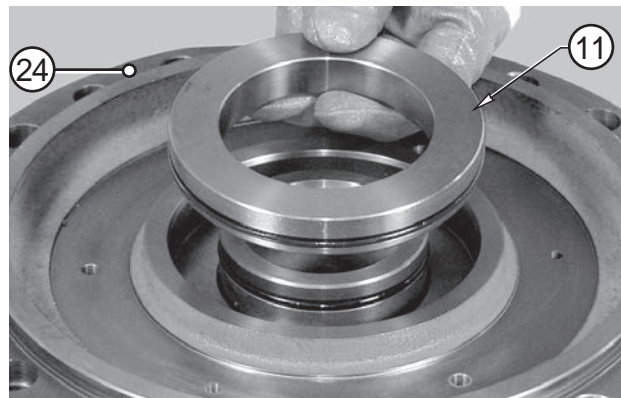
**FIGURE 20:** Check the position of the anti-extrusion (4) and o-rings (2, 25). Lubricate the piston and the o-rings and install the unit (3) into the cylinder (24).



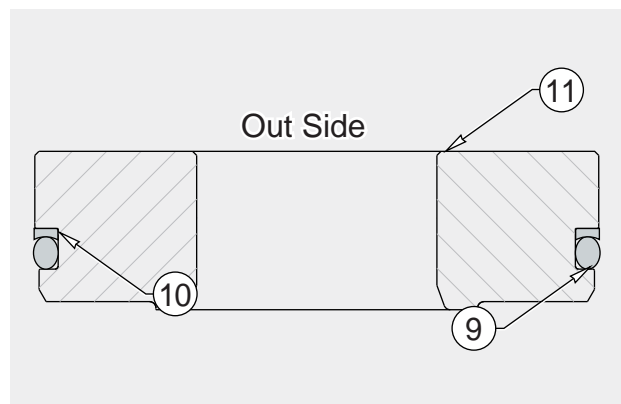
**FIGURE 21:** Using a plastic hammer, install the piston (3) into the cylinder (24).

### NOTE:

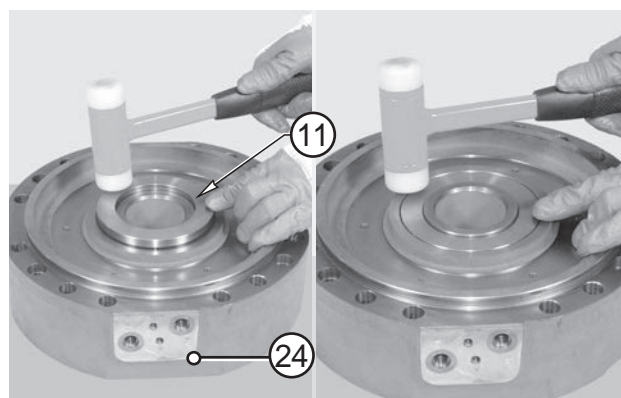
Lightly hammer all around the edge in an alternate sequence.



**FIGURE 22:** Fit o-ring (9) and anti-extrusion ring (10) onto the piston (11). Lubricate the piston and the o-rings and install the unit into the cylinder (24).



**FIGURE 23:** The o-rings always have to be assembled from the pressure facing side.

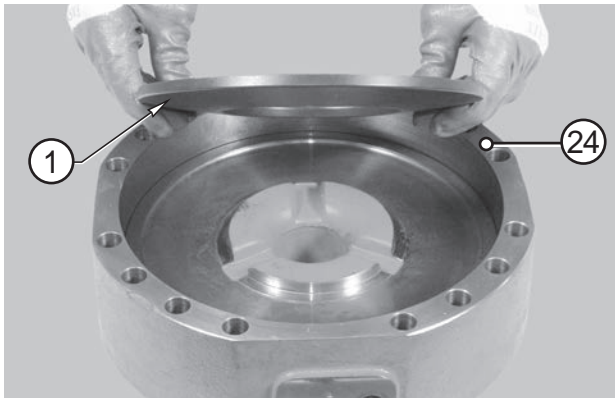


**FIGURE 24:** Using a plastic hammer, install the piston (11) into the cylinder (24).

### NOTE:

Lightly hammer all around the edge in an alternate sequence.

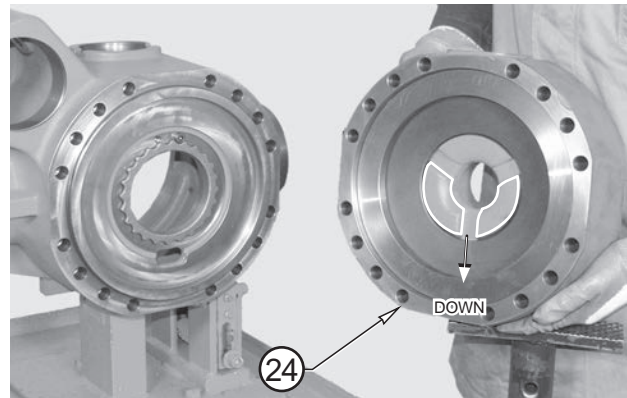




**FIGURE 25:** Position the Belleville washers (1) and engage the cylinder (24).

**NOTE:**

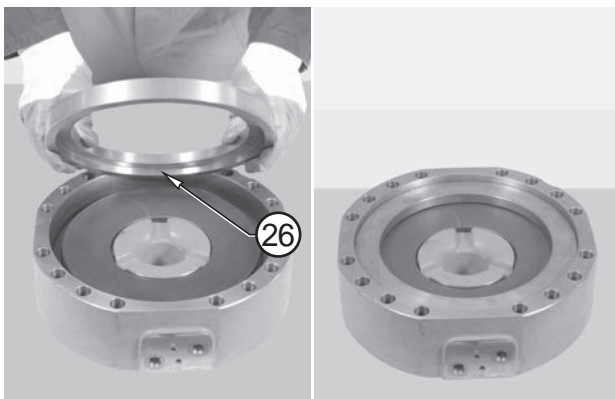
Check the sense of direction of Belleville washers (1) and relative centering.



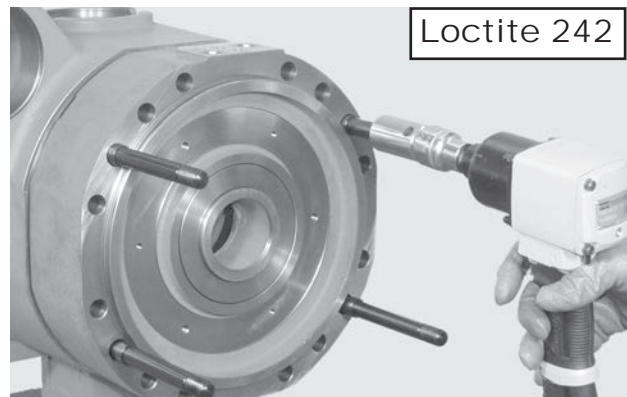
**FIGURE 28:** Engage the cylinder (24).

**NOTE:**

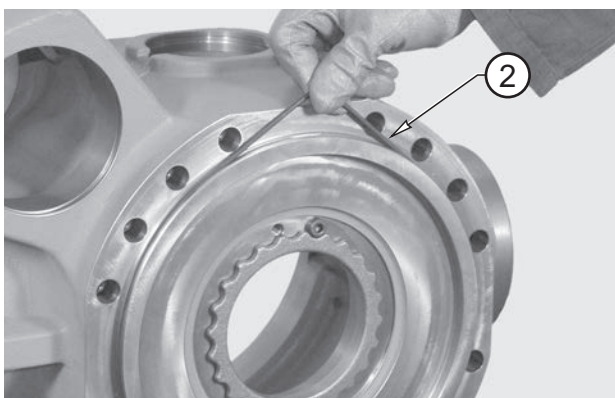
Check the sense of direction of washers (1) and relative centering.



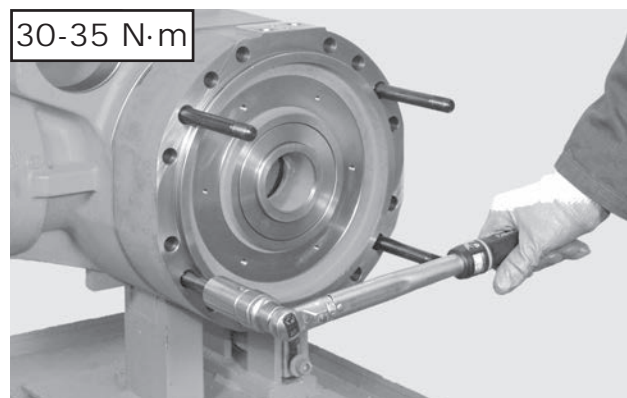
**FIGURE 26:** Install the centering device (26) in the cylinder.



**FIGURE 29:** Insert the screws and tighten them alternately. Lock the cylinder.

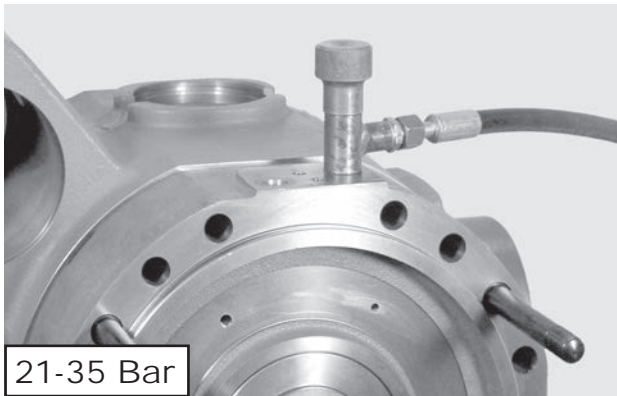


**FIGURE 27:** Check integrity and position of the cylinder's o-ring (2).



**FIGURE 30:** Tightening the studs to a torque of 30 - 35 N·m.

# ASSEMBLY

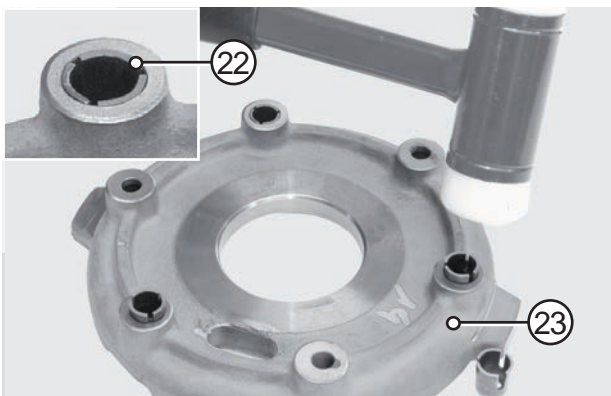
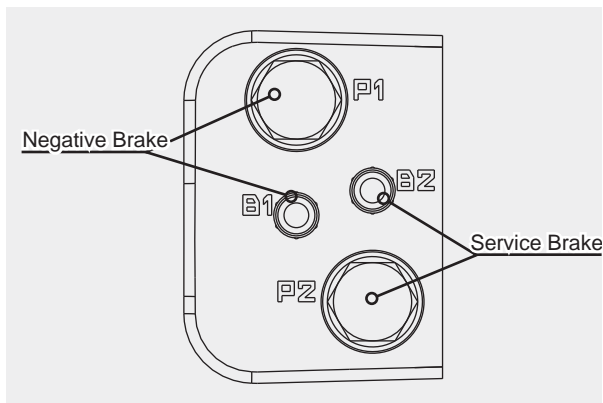


**FIGURE 31:** Connect an external pump to the negative brake and introduce pressure to 21 -35 bar.

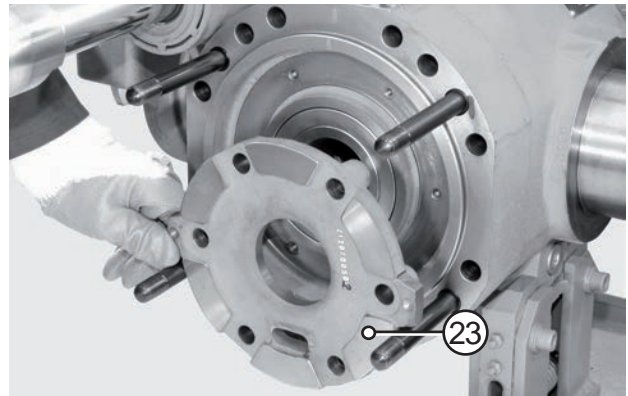
## DANGER

Always check that the hydraulic circuit test for leaks under pressure. Always use a cardboard or a panel to control the loss.

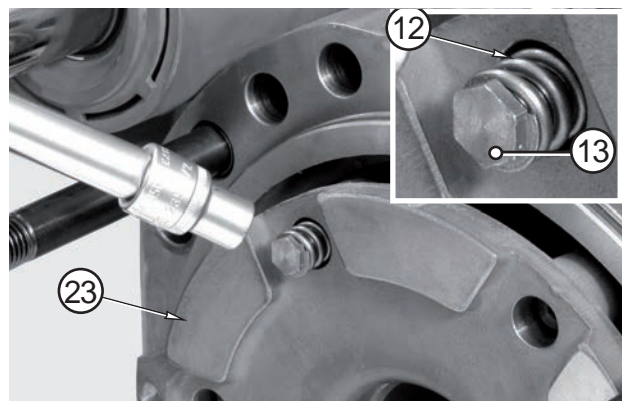
A leak from a hole of the size of a pin can cause serious injury. If fluid is injected into the skin it is necessary to seek immediate medical care.



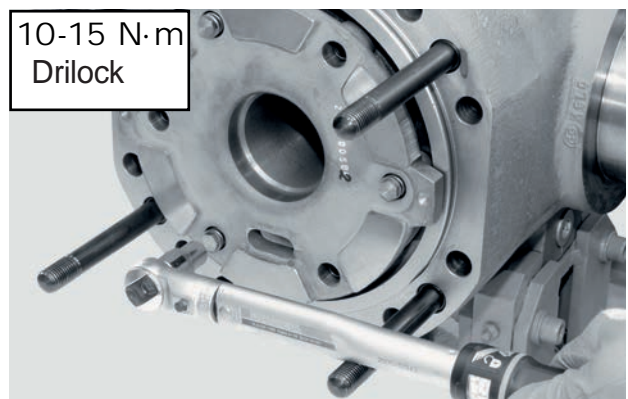
**FIGURE 32:** Insert the stroke automatic regulation springs (22); place them in line with the piston (23).



**FIGURE 33:** Insert the intermediate disk (23).



**FIGURE 34:** Fit the reversal springs (12, 13) on the intermediate disk (23).

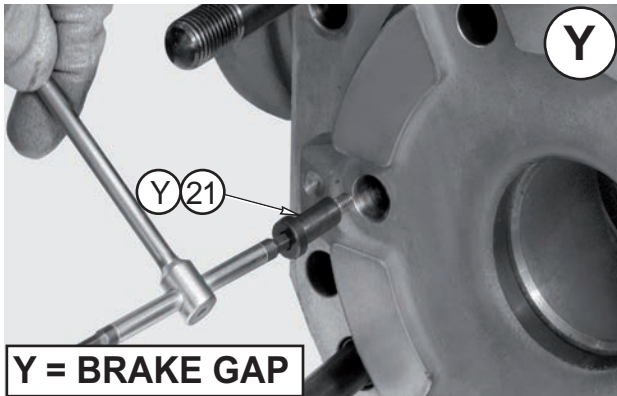


**FIGURE 35:** Tighten with torque wrench setting of 10 - 15 N·m

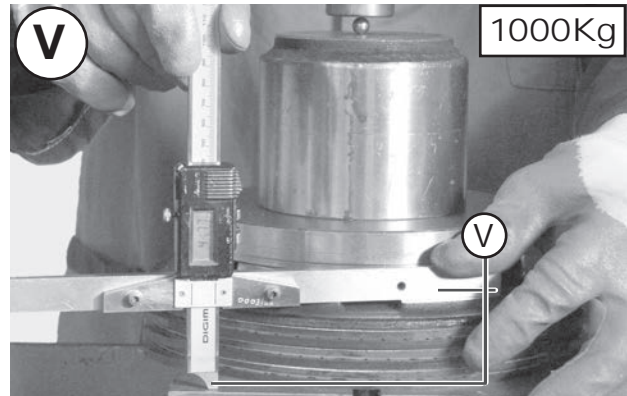
## CAUTION

Use only new screws pre-treated with Drilock locking adhesive. Threads must be cleaned from oil. Degrease only non pre-treated threads.

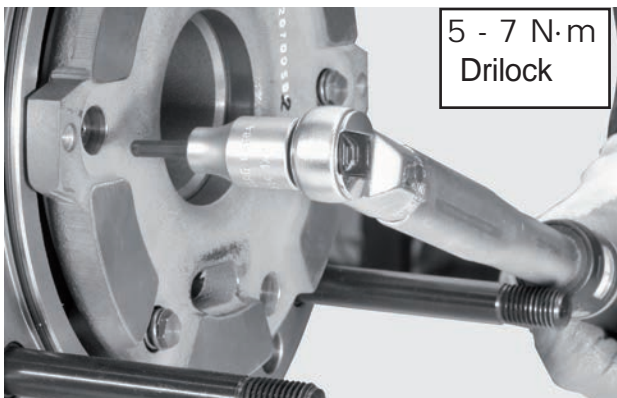




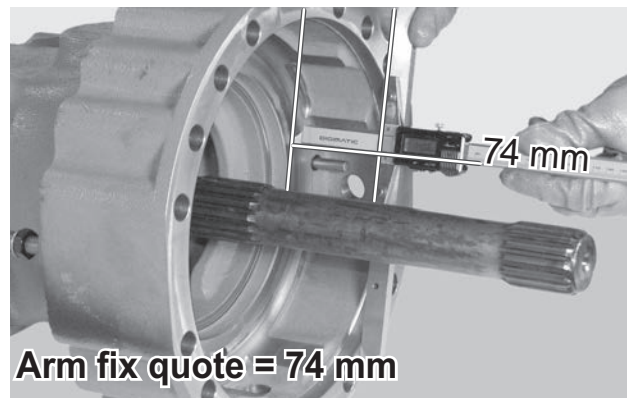
**FIGURE 36:** Y=brake gap  
0,75mm 1,00mm 1,25mm 1,50mm  
depending on axle configuration.



**FIGURE 39:** Put the brake disc pack including the shim under a press, load with 1000 kg and take the measure "V".  
EXAMPLE: V = 42,33 mm



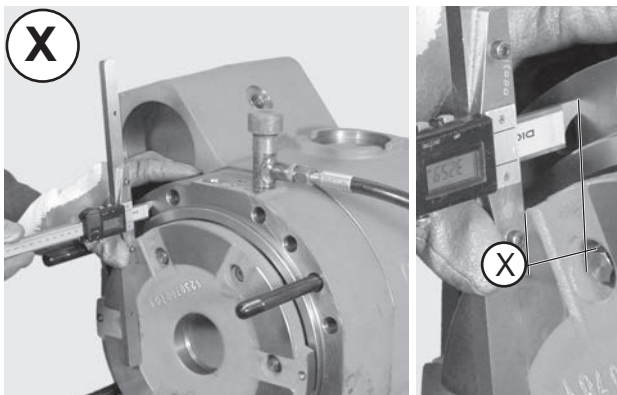
**FIGURE 37:** Fit the pin screws.  
Torque wrench setting: 5-7 N·m.



**FIGURE 40:** Arm fix quote = 74 mm

## ⚠ CAUTION

Use only new screws pre-treated with Drilock locking adhesive. Threads must be cleaned from oil. Degrease only non pre-treated threads.

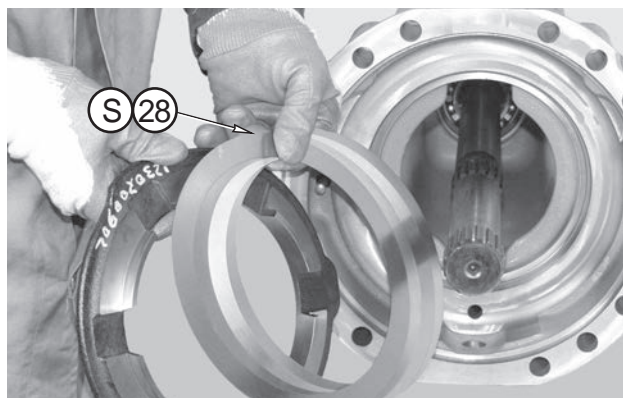


**FIGURE 38:** Take the measurement from the surface of the intermediate disk to the cover sealing surface with 30 bar of pressure introduced.  
EXAMPLE: 29 mm

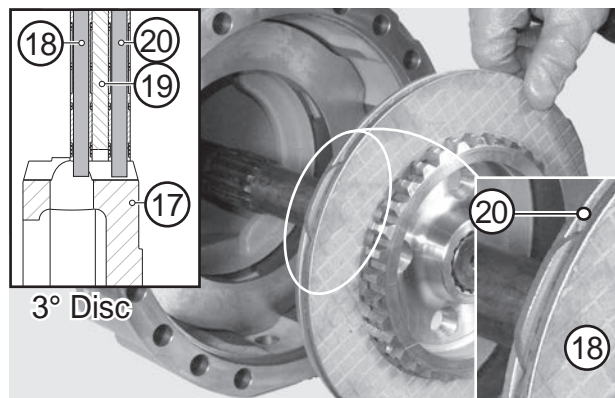


**FIGURE 41:**  $S = 74 \text{ mm} - (x + y + v)$  = Thickness of shims to insert under the shim washer.  
EXAMPLE:  $74 \text{ mm} - (29 + 42,33 + 1,25) = S = 1,42 \text{ mm}$

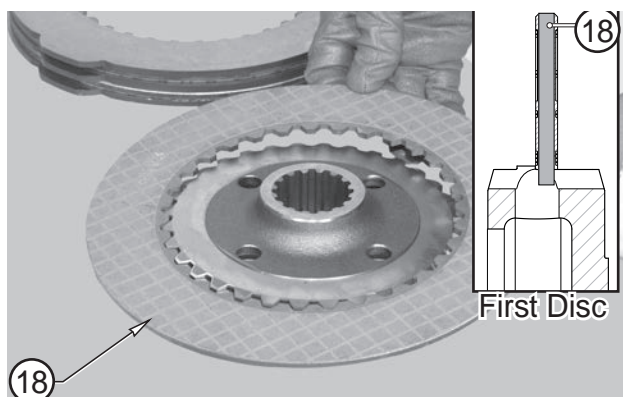
# ASSEMBLY



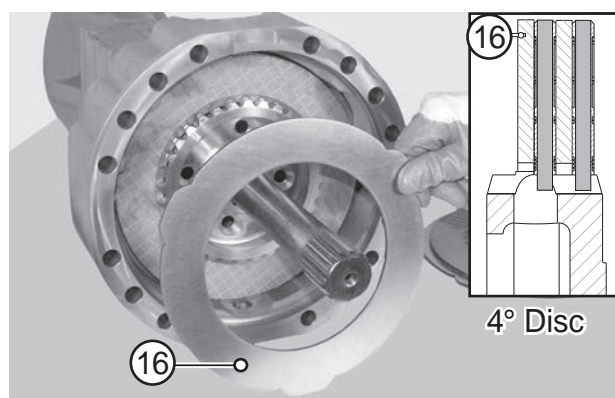
**FIGURE 42:** Insert under the shim washer a thickness of shims (28).



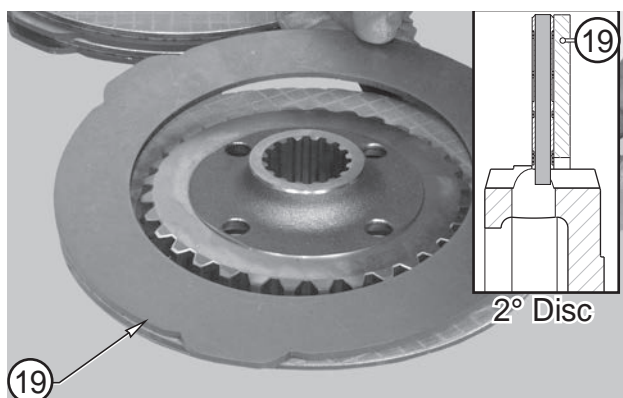
**FIGURE 45:** Install the friction disc (18) on the flange (17) from arm side and insert the group on the u-joint.



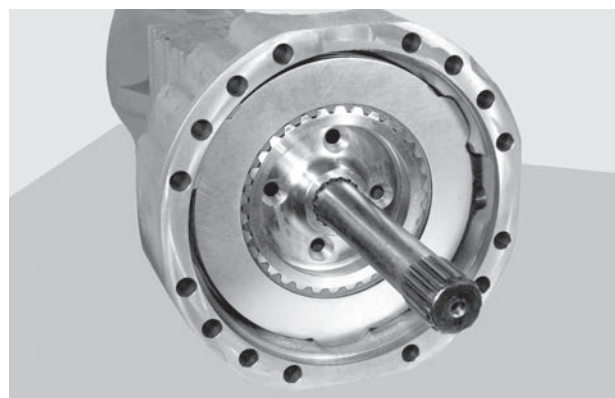
**FIGURE 43:** Install the friction disc (18) on the flange (17) from arm side.



**FIGURE 46:** Insert on the flange the discs (16, 15, 14).



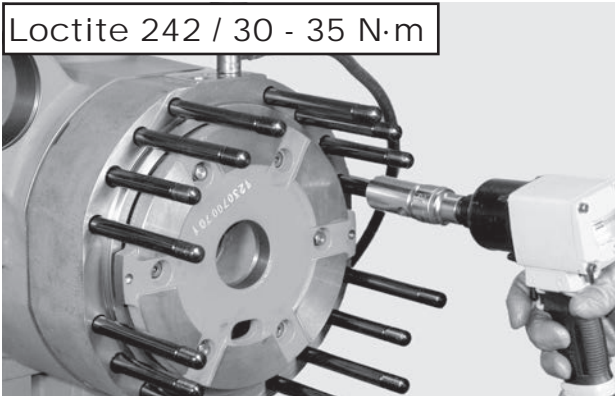
**FIGURE 44:** Install the metal disc (19) on the flange (17) from arm side.



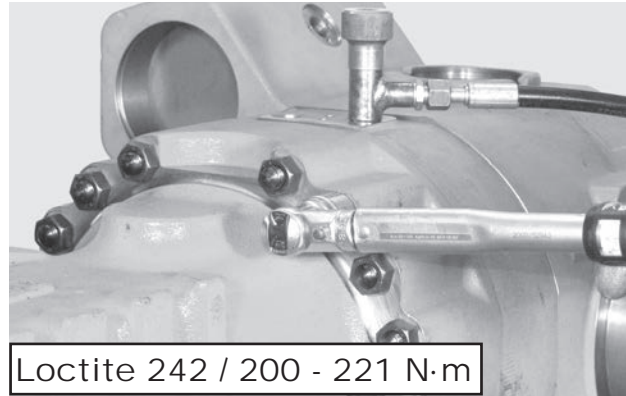
**FIGURE 47:** Check the alignment of last disc (14) and flange (17).



Loctite 242 / 30 - 35 N·m

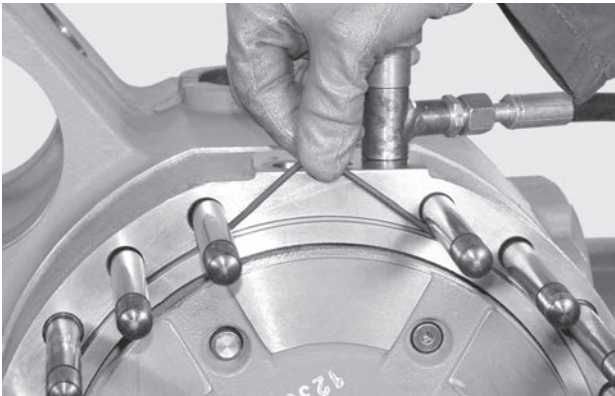


**FIGURE 48:** Apply Loctite 242 to the studs and tighten to 30 - 35 N·m



Loctite 242 / 200 - 221 N·m

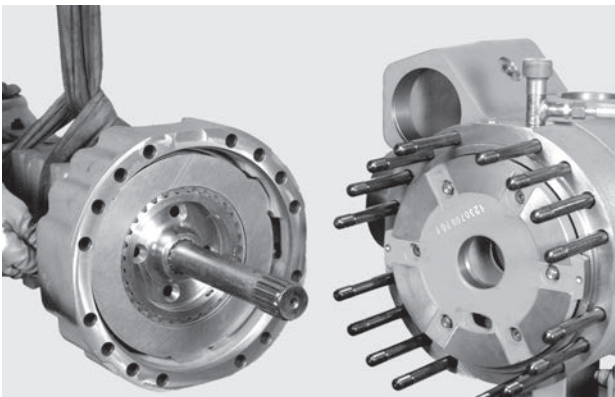
**FIGURE 51:** Tighten the nuts in two stages to 200 - 221 N·m.



**FIGURE 49:** Check integrity and position of the cylinder's o-ring.



**FIGURE 52:** Gradually release the pressure in the braking circuit, bringing it to zero through the external pump.



**FIGURE 50:** Check integrity and position of the arm's o-ring; install the complete arm.

## NOTE:

To assist axle shaft centering, slightly move the wheel hub.

## ⚠ DANGER

Do not remove any part of the hydraulic circuit without having completely released the hydraulic pressure.

The removal of pressurized parts or loss caused from releasing these components can cause serious injuries and even death. A leak from a hole of the size of a pin can cause serious injury. If fluid is injected into the skin it is necessary to seek immediate medical care.

## ASSEMBLY

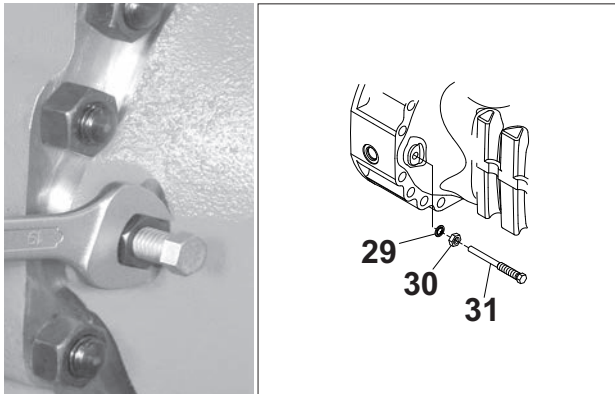


**FIGURE 53:** Gradually loosen the sleeve and remove.

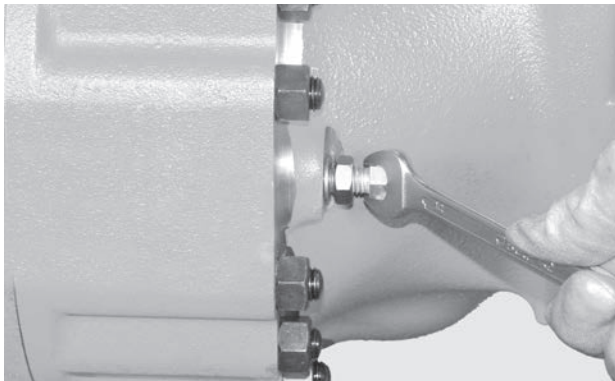
### **DANGER**

Carefully check that the hydraulic pressure is discharged completely before removing the external pump sleeve connected to the brake.

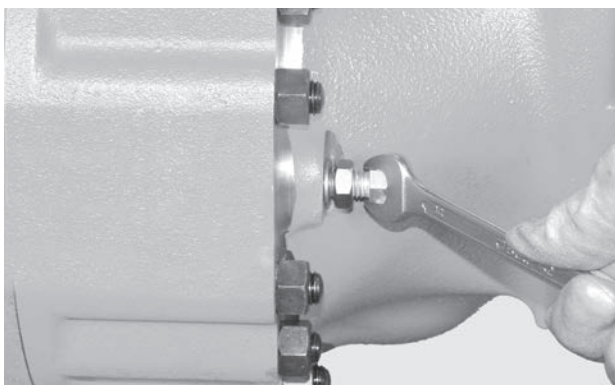
## RELEASE



**FIGURE 54:** Loosen nuts (30) of screws (31) provided for the mechanical and manual release of the braking units, then move the nuts backwards by approximately 8 mm.



**FIGURE 55:** Tighten screws (31) to fasten them onto the pressure plate (23).

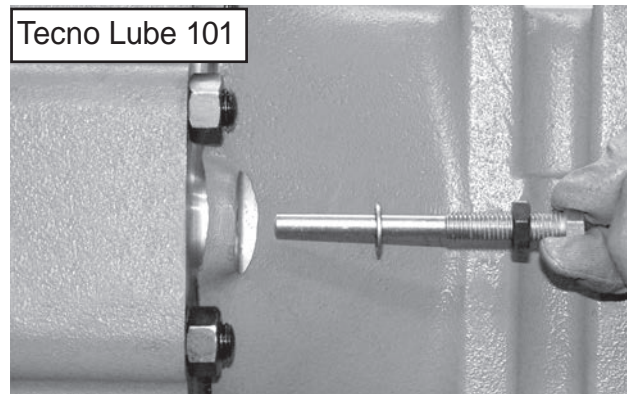


**FIGURE 56:** Using a wrench, tighten the screws (31) in an alternate sequence by 1/4 turn at a time so as to compress the Belleville washers and disengage the braking disks.

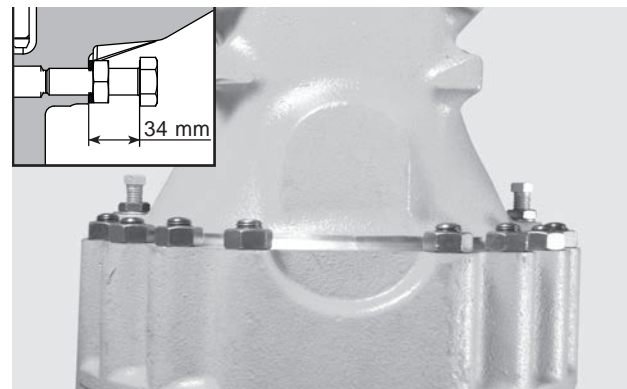
### ⚠ CAUTION

Tighten maximum by one turn.

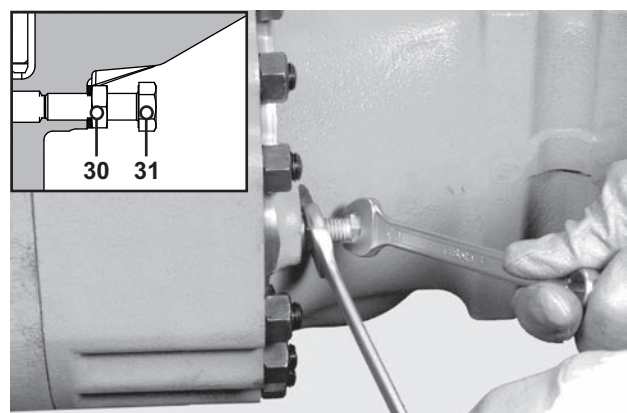
## ADJUST



**FIGURE 57:** Remove screws complete with nuts and seals. Replace seals, apply silicone-based Tecno Lube /101 grease to the screws and install all parts into the arm.



**FIGURE 58:** Adjust screws (31) to obtain a distance of  $34 \pm 0.5$  mm between axle machined surface and screw underhead.



**FIGURE 59:** Lock into position with nuts (30).

### ⚠ CAUTION

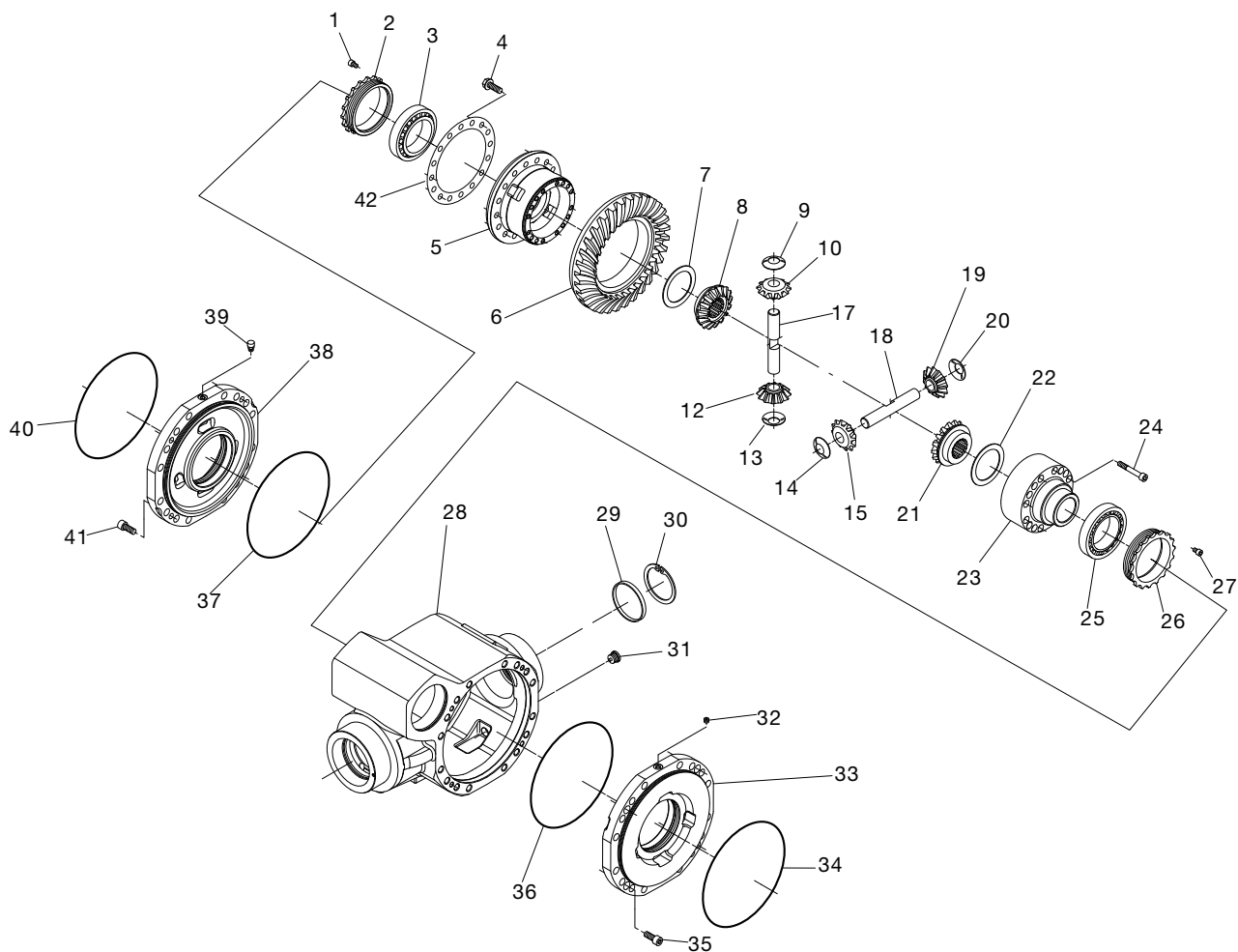
Hold screws (31) into position while locking the nuts (30); after locking, check the distance of screws (31) once more.





# DIFFERENTIAL UNIT

## EXPLODED VIEW

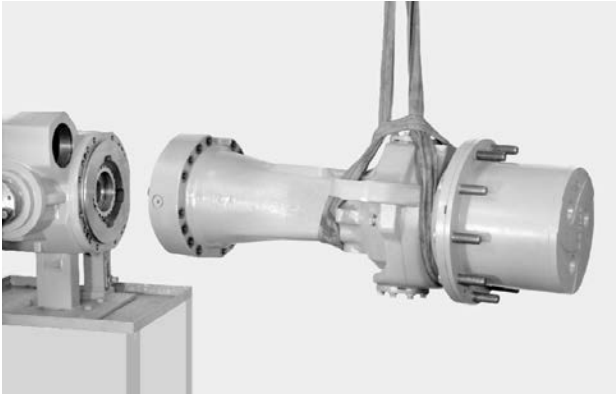


# DISASSEMBLY

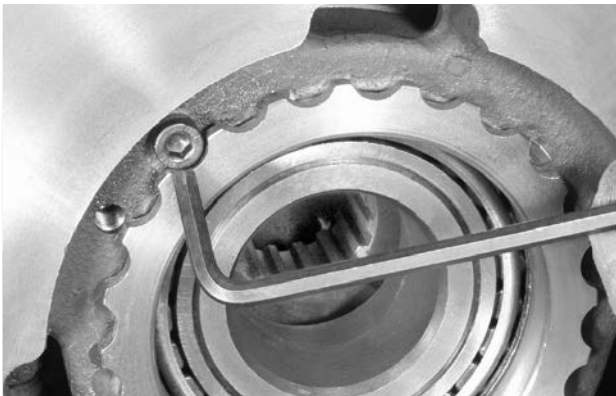
## DISASSEMBLY

### CAUTION

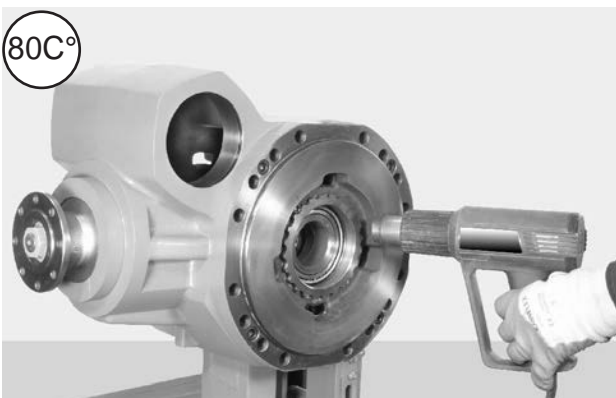
Before draining oil, release the internal pressure, for details see OIL DRAINING MANDATORY PROCEDURE p. 12.



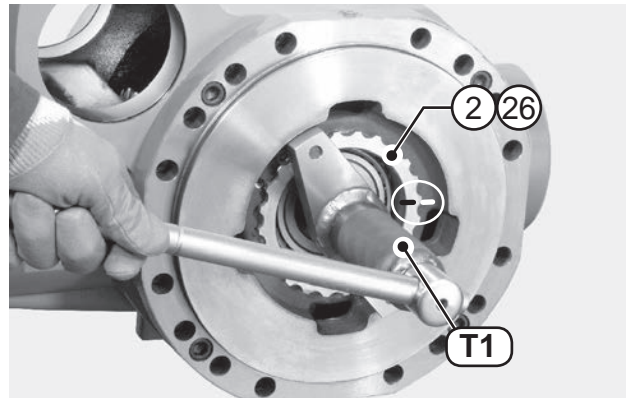
**FIGURE 1:** Sling the arm to be removed and connect it to a hoist. Loosen and remove screws and nuts.



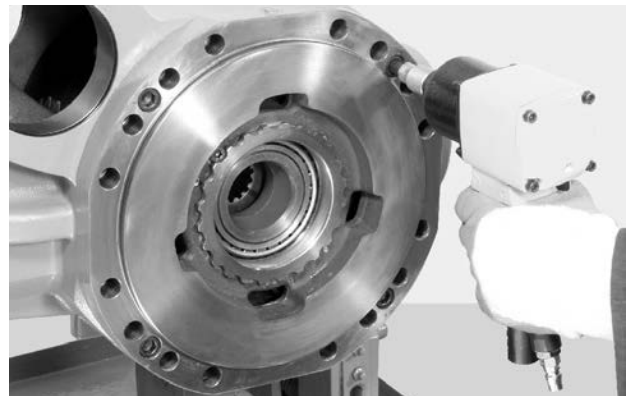
**FIGURE 2:** Only if removing or adjusting, remove the screw (27).



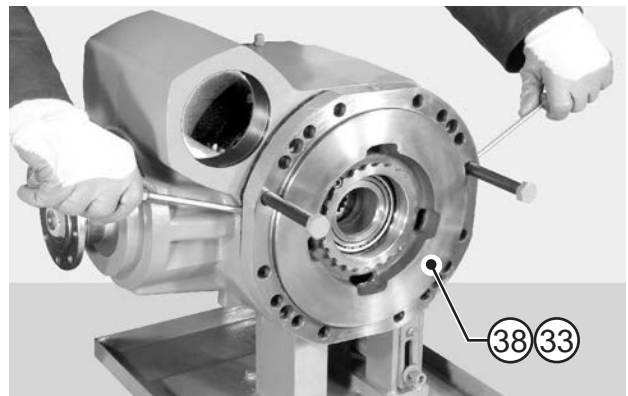
**FIGURE 3:** Only if removing or adjusting, uniformly heat the ring nuts up to a temperature of 176 °F [80 °C].



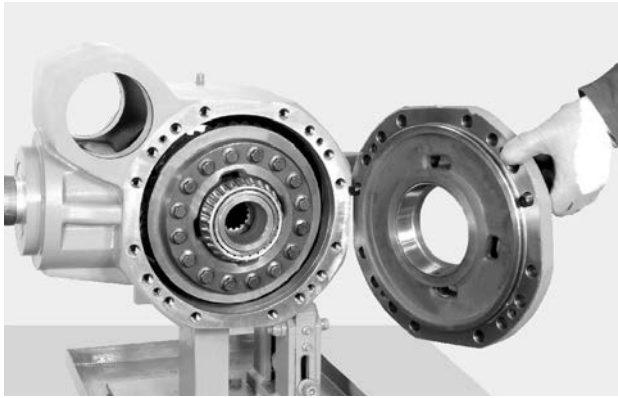
**FIGURE 4:** Only if removing or adjusting, use special tool T1 (See drawing T1 p. 79) to mark the position of the ring nuts (2) and (26).



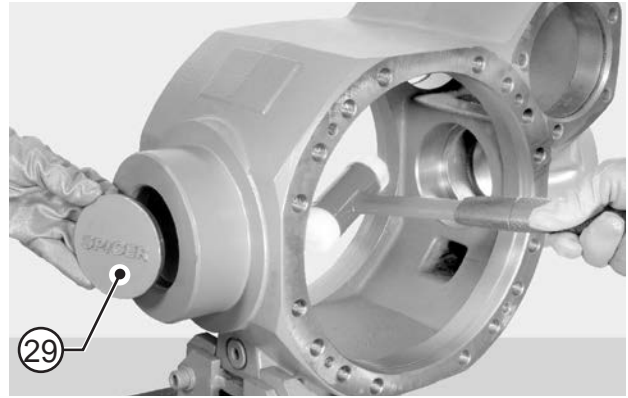
**FIGURE 5:** Loosen the stud bolts (35, 41) and remove two of them.



**FIGURE 6:** Disjoin the cover (38, 33) crown side.



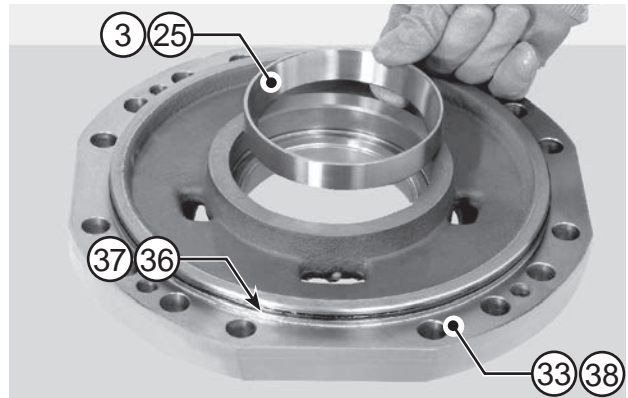
**FIGURE 7:** Remove the cover and studs.



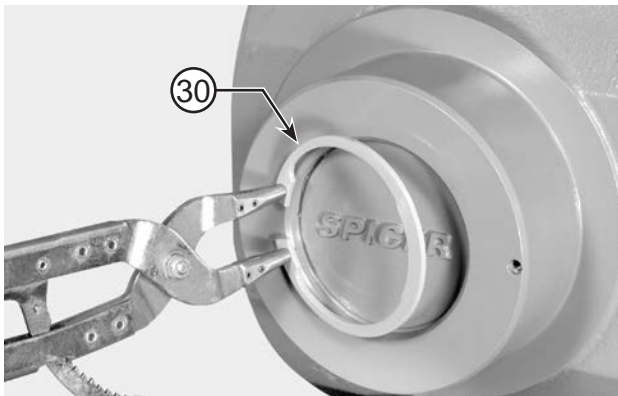
**FIGURE 10:** Remove the cap (29).



**FIGURE 8:** Extract the whole differential unit.



**FIGURE 11:** If the bearings need replacing, extract the external thrust blocks of the bearings (3) and (25) from middle cover (33, 38).



**FIGURE 9:** Remove the snap ring (30).

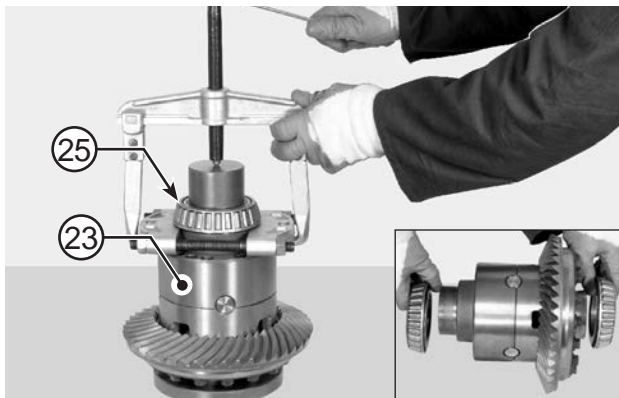
**NOTE:**

Accurately check the o-ring (37, 36).

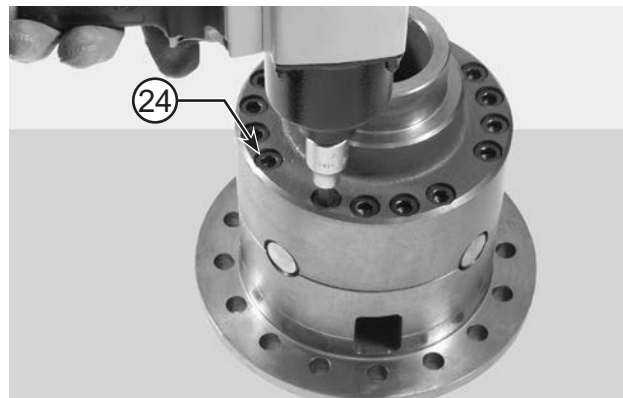


**FIGURE 12:** If the bearing needs replacing, extract the bearing (3).

# DISASSEMBLY



**FIGURE 13:** If the bearing need replacing, extract the bearing (25) from the differential carrier (23).



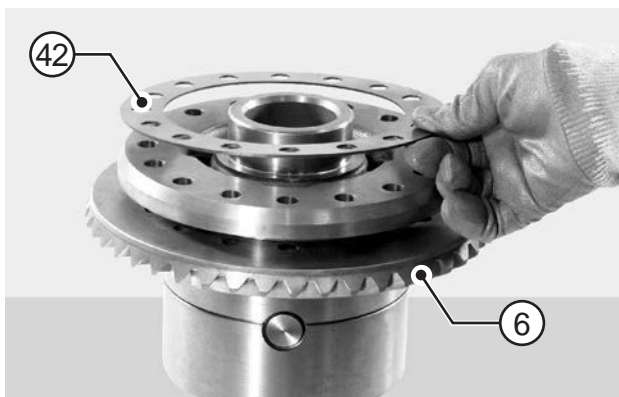
**FIGURE 16:** Remove the screws (24) joining the differential unit half box.



**FIGURE 14:** Remove the ring gear (6) capscrews (4).



**FIGURE 17:** Using a plastic hammer, take the half box (23, 5) to pieces.



**FIGURE 15:** Remove the spacer (42) and the ring gear (6).

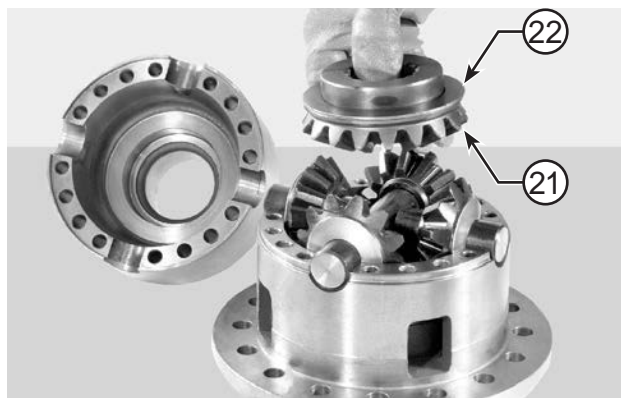
## **NOTE:**

**Write down the coupling marks.**

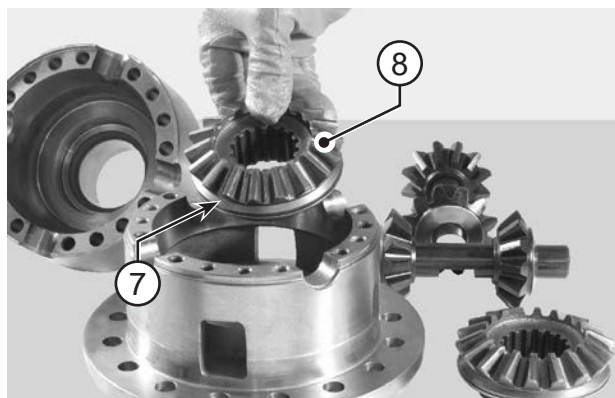


**FIGURE 18:** Remove the upper half box (23).

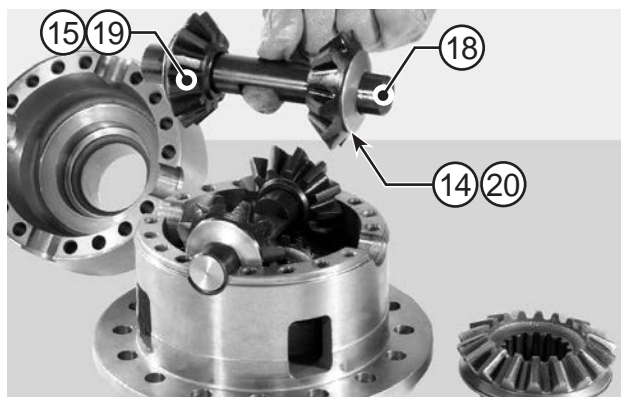




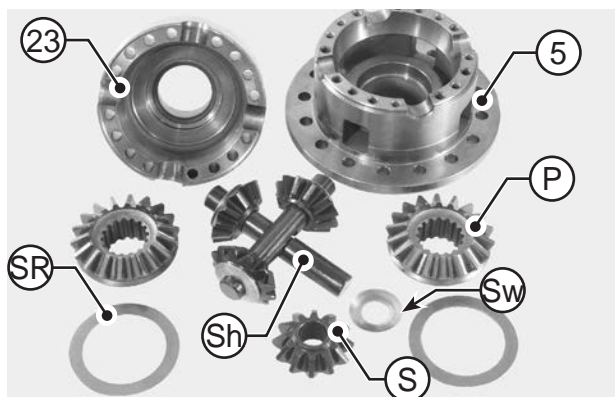
**FIGURE 19:** Remove shoulder (22) and first planetary gear (21).



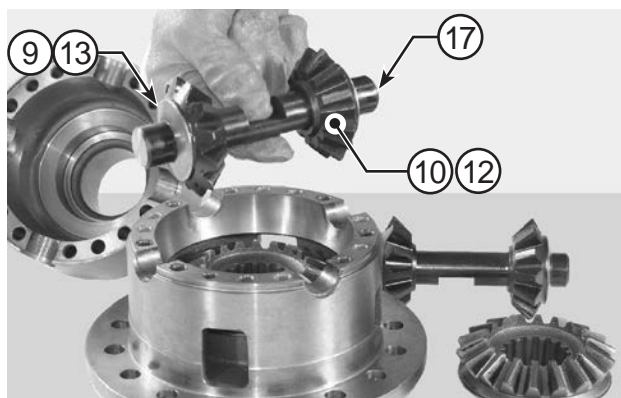
**FIGURE 22:** Remove the 2nd planetary gear (8) and shoulder ring (7).



**FIGURE 20:** Remove shafts (18), complete with planetary gears (15, 19) and spherical shoulder washers (14, 20).



**FIGURE 23:** The differential unit.



**FIGURE 21:** Remove shafts (17), complete with planetary gears (10, 12) and spherical shoulder washers (9, 13).

Sh = Shafts (18)(17)

SW = spherical shoulder washers (9)(13)(14)(20)

P = planetary gears (8)(21)

SR = shoulder ring (22)(7)

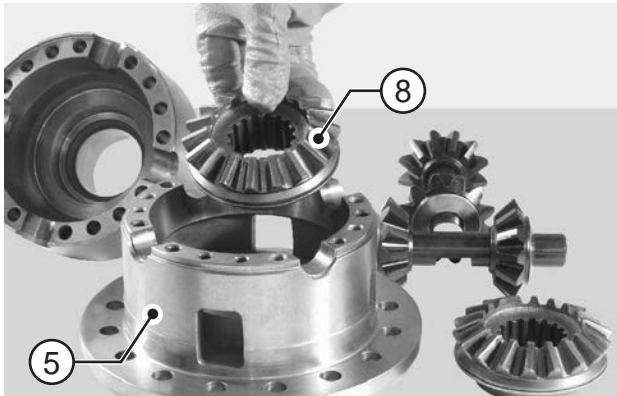
S = planet wheels (10)(12)(15)(19)

23 = upper half box

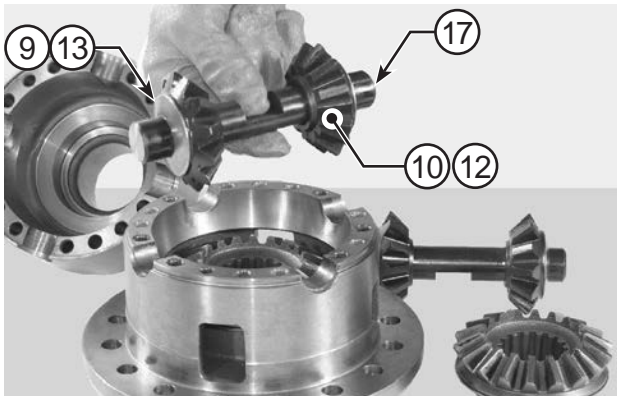
5 = half box crown side

# ASSEMBLY

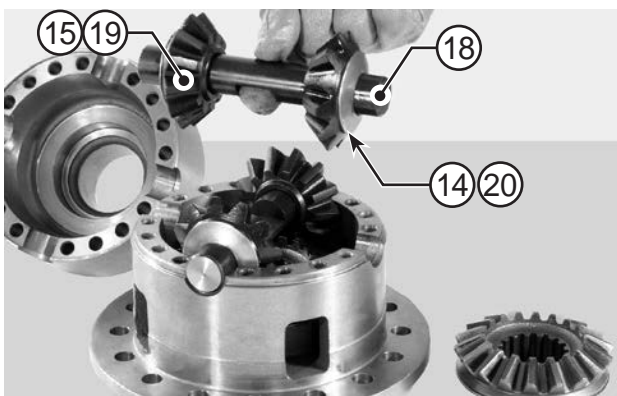
## ASSEMBLY



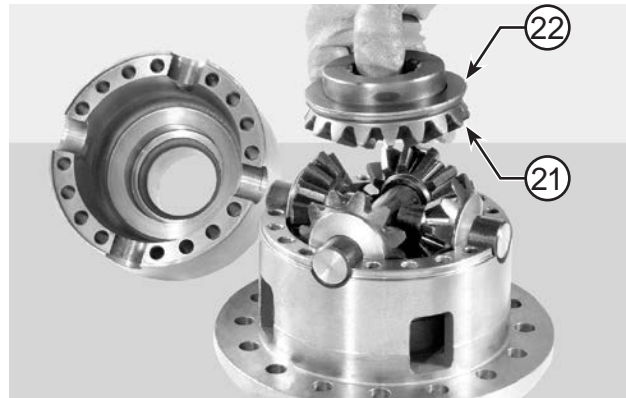
**FIGURE 24:** Install the shoulder ring (7) and planetary gear (8) into the half-box (5).



**FIGURE 25:** Install the planetary gears (10, 12) and spherical shoulder washers (9, 13) onto the shafts (17). Install the planetary set.



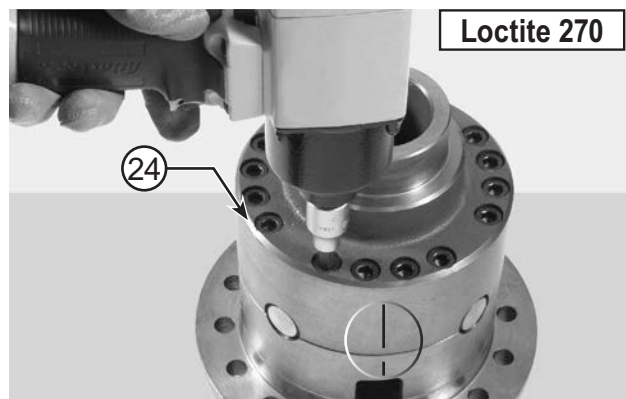
**FIGURE 26:** Install the planetary gears (15, 19) and spherical shoulder washers (14, 20) onto the shafts (18). Install the planetary set.



**FIGURE 27:** Install the planetary gear (21) and shoulder ring (22).



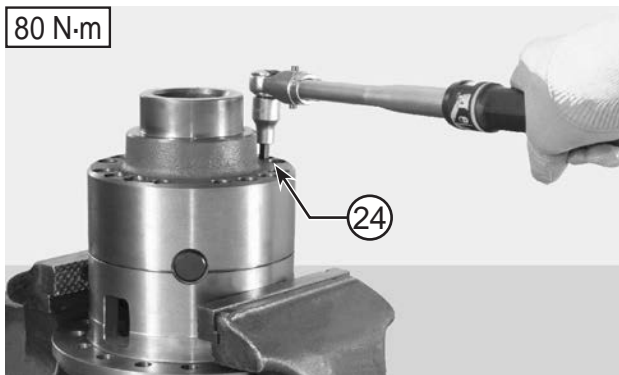
**FIGURE 28:** Mount the locking half-box (5) onto the half-box (23).



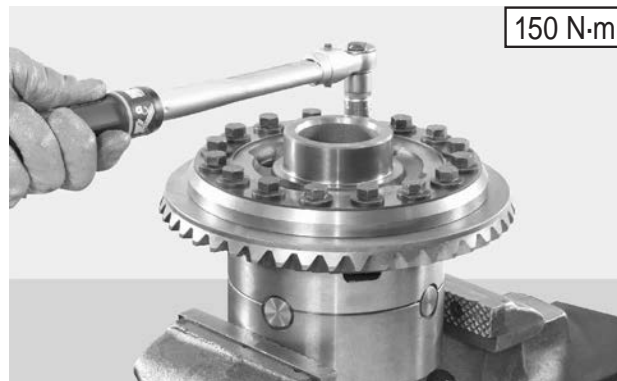
**FIGURE 29:** Lock the half box with screws (24) coated with Loctite 270.

### ⚠ CAUTION

- 1 - The match marks on the two half-boxes must correspond.
- 2 - Use only new screws.



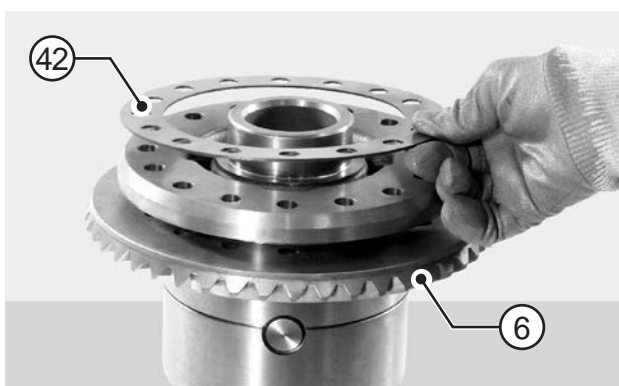
**FIGURE 30:** Fit the complete differential unit in a vice and tighten the screws (24) holding the two half boxes together to a torque of 80 N·m.



**FIGURE 33:** Lock the ring gear (6) by tightening the screws (4) to a torque of 150 N·m using the criss-cross method.

## ⚠ CAUTION

Tighten screws using the criss-cross method.



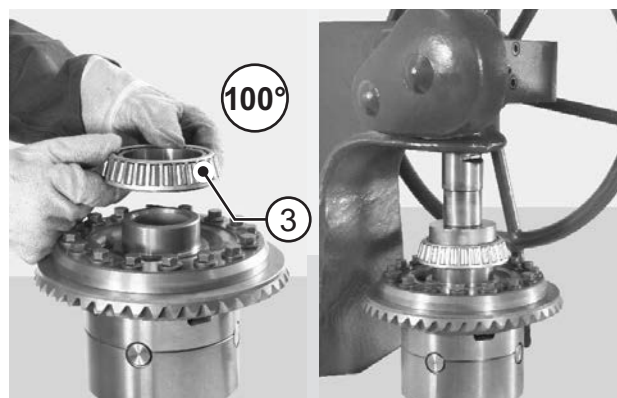
**FIGURE 31:** Install the spacer (42) and the ring gear (6).



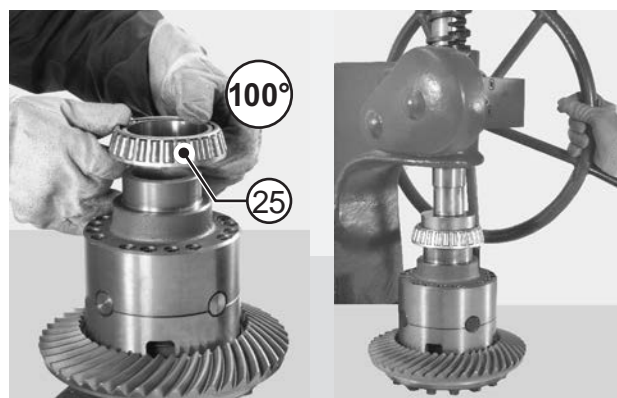
**FIGURE 32:** Mount the ring gear (6) and fasten it to the differential box with screws (4).

## ⚠ CAUTION

Use only new screws.



**FIGURE 34:** INSTALLATION OF THE DIFFERENTIAL UNIT  
Position the differential unit under a press and, using a driver with an adequate diameter, install the first bearing (3).



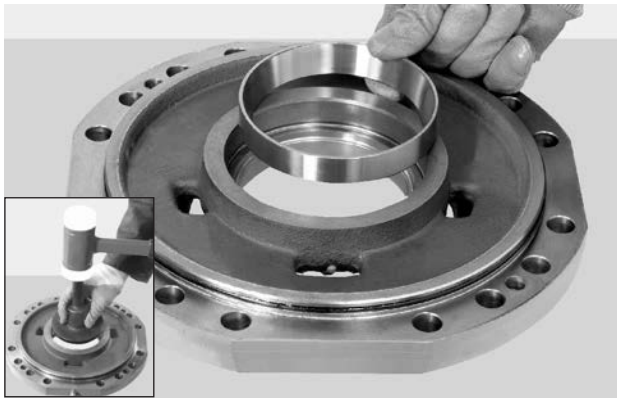
**FIGURE 35:** Turn the unit upside down and install the second bearing (25).

## ⚠ CAUTION

Pay particular attention; position a shim with adequate diameter in order to engage the internal ring of bearing without engaging the cage.



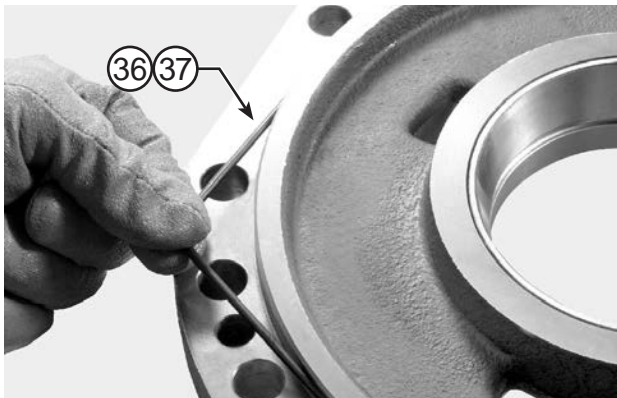
# ASSEMBLY



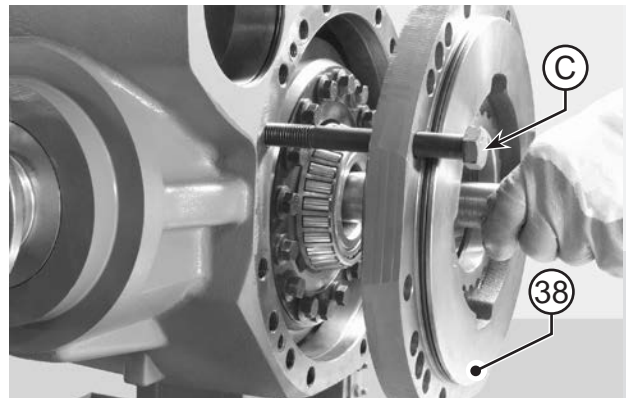
**FIGURE 36:** Only if bearings are replaced, insert the thrust blocks of the bearings into the intermediate covers.



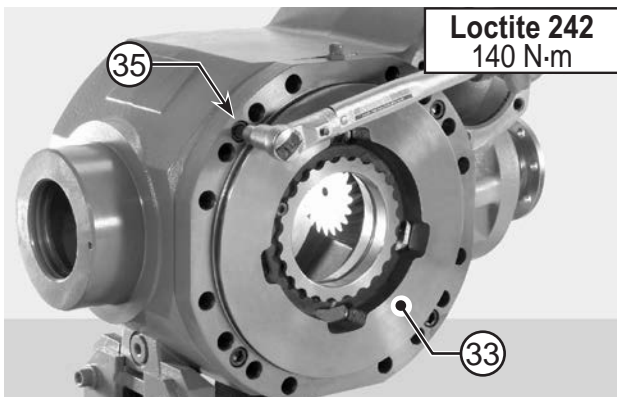
**FIGURE 39:** Position the differential unit in the central body with the help of a bar and fit the middle cover.



**FIGURE 37:** Thoroughly check the condition of the o-ring (36, 37).



**FIGURE 40:** Tighten the two safety screws "C" into the main body (28) and install the intermediate cover (38).

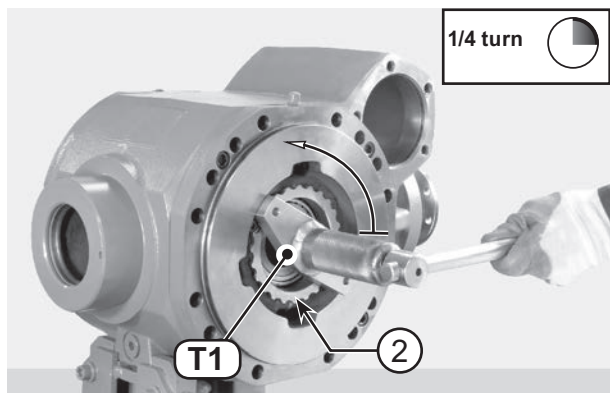


**FIGURE 38:** Fit the intermediate cover (33) on opposite side of ring gears: lock cover with screws (35) coated with Loctite 242. Tighten screws to a torque of 140 N·m.

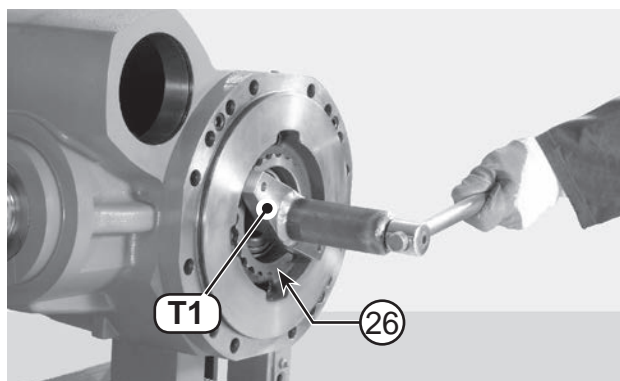


**FIGURE 41:** Tighten screws to a torque of 140 N·m.





**FIGURE 42:** Only if ring nuts have been removed, tighten the ring nut (2) on ring gear side until clearances between pinion and ring gear are zeroed. Then, loosen by about 1/4 turn.



**FIGURE 43:** Only if ring nuts have been removed, preload bearings with ring nut (26) on non-ring gear side in order to increase the torque of the pinion.

## ⚠ CAUTION

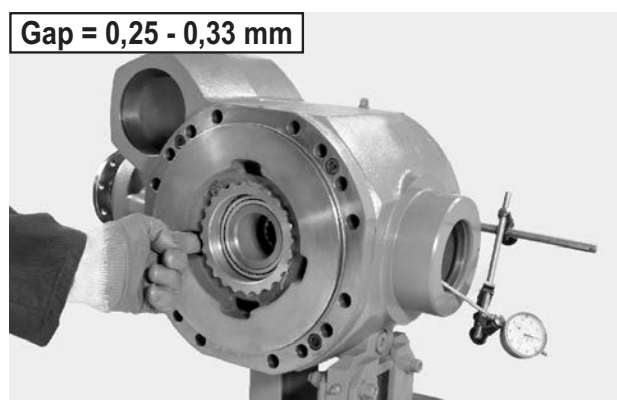
In the case of used bearings, check thrust torque; in the case of new bearings, check continuous torque.



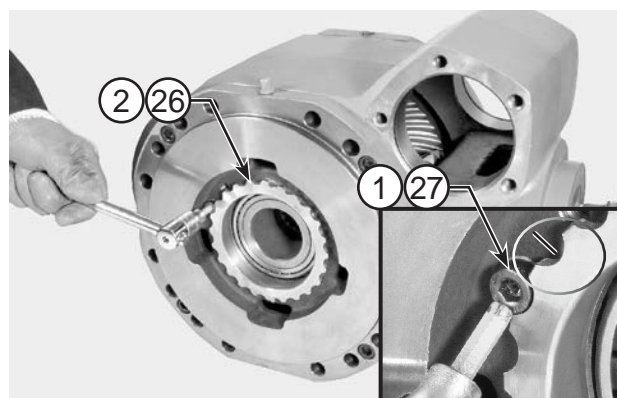
**FIGURE 44:** Apply torque meter TM to pinion nut and check that torque will increase by 20 - 40 N·cm as a result of differential bearing preload.  
Example: pinion torque: 120 - 130 N·cm Pinion + differential torque: 140 - 170 N·cm.



**FIGURE 45:** Introduce a gauge "A" with long tracer through the hole provided for the cap. Position the tracer on the side of a tooth of the ring gear, approximately 5 mm from the outer rim; preload by about 1 mm and zero the gauge.

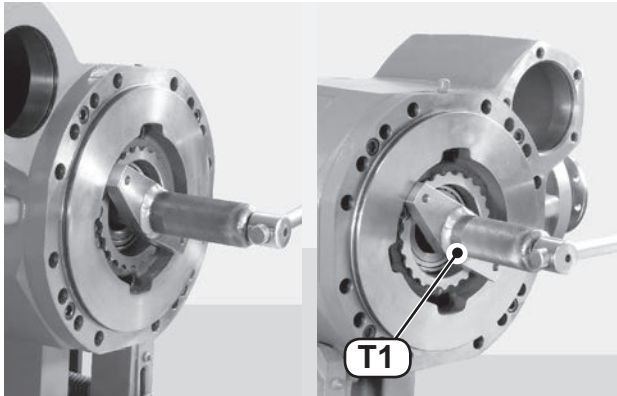


**FIGURE 46:** As you hold the pinion in position, move the ring gear manually in both directions to check clearance between pinion and ring gear. Standard clearance: 0,25 - 0,33 mm

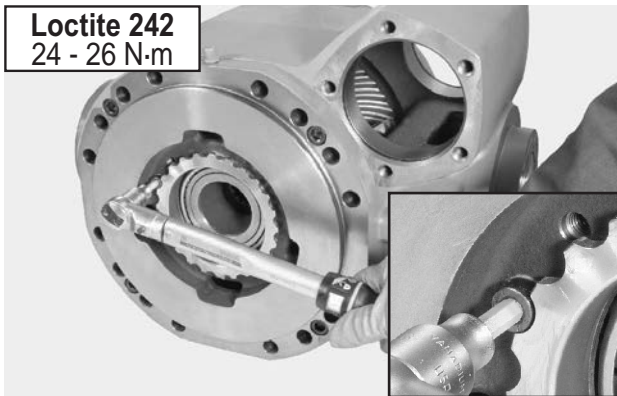


**FIGURE 47:** If torque and/or pinion-ring gear clearance is not within tolerance values and the ring nuts have not been removed, mark the position of the ring nuts (2, 26) and remove the safety plates (1, 27).

# ASSEMBLY



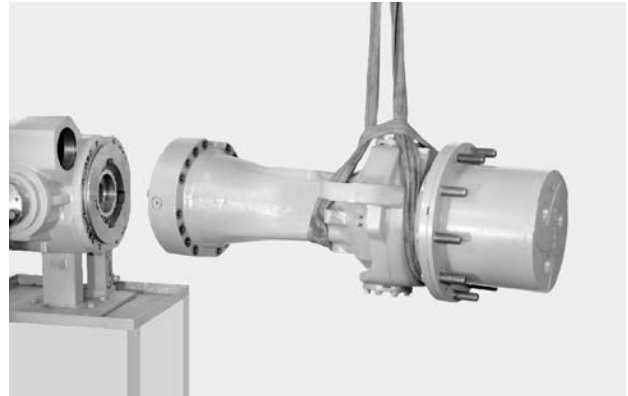
**FIGURE 48:** Adjusting clearance between pinion and ring gear. To INCREASE: loosen the ring nut on ring gear side and tighten the ring nut on non-ring gear side by the same measure. To DECREASE: perform the same operations inversely. To rotate ring nuts, use special wrench T1 (See drawing T1 p. 79).



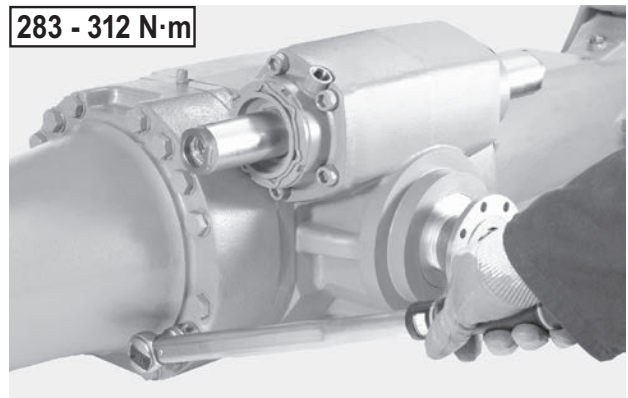
**FIGURE 49:** Engage screw (27) in the slot next to the holes provided for the check screws. Coat screws (27) with Loctite 242 and tighten to a torque of 24 - 26 N·m.



**FIGURE 50:** Fit the top plug after applying repositionable jointing compound for seals to the rims. Install the snap ring.



**FIGURE 51:** Install the complete arm.



**FIGURE 52:** Torque wrench setting: 283 - 312 N·m.

## **NOTE:**

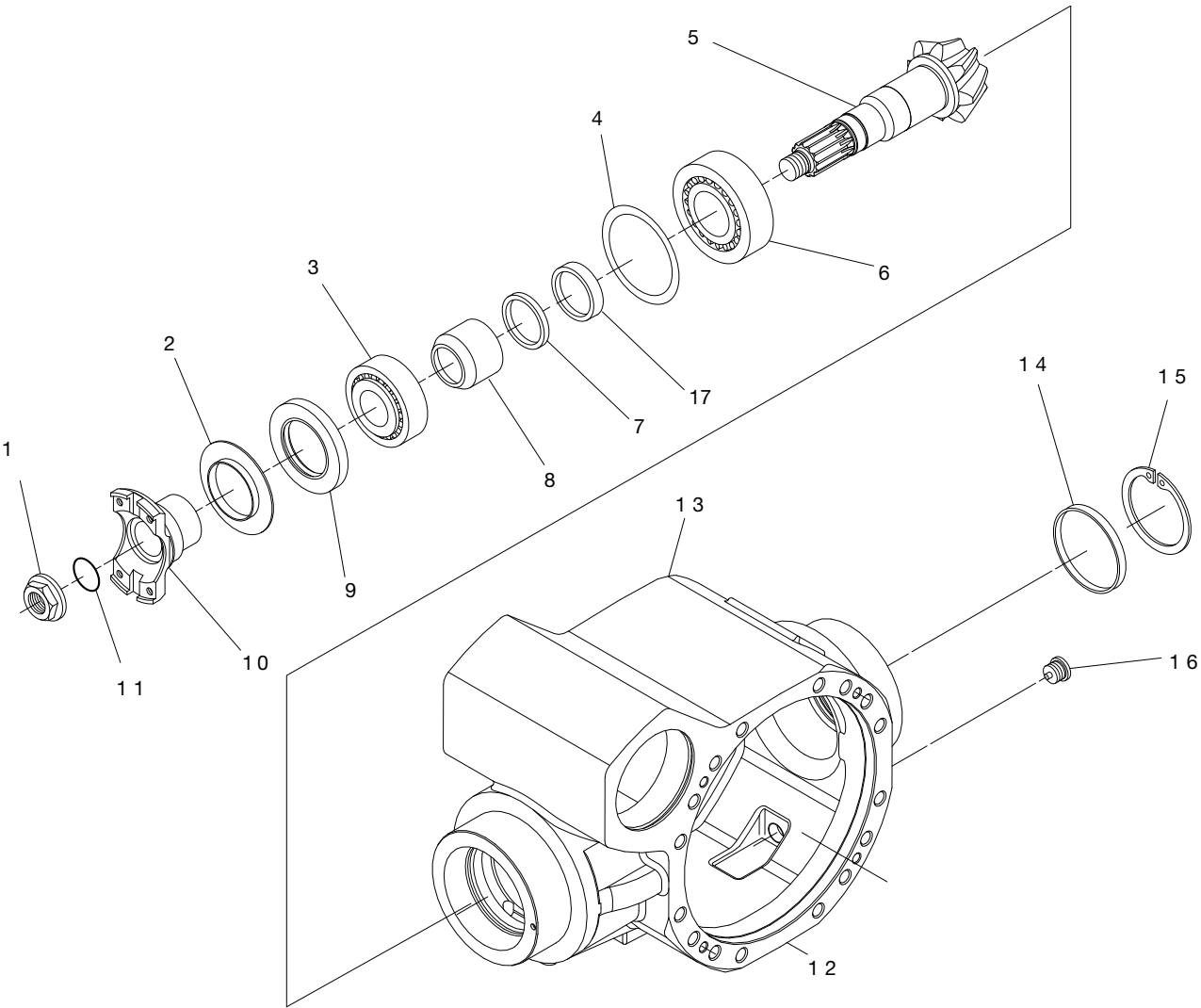
**Tighten using the criss-cross method.**





# BEVEL PINION

## EXPLODED VIEW

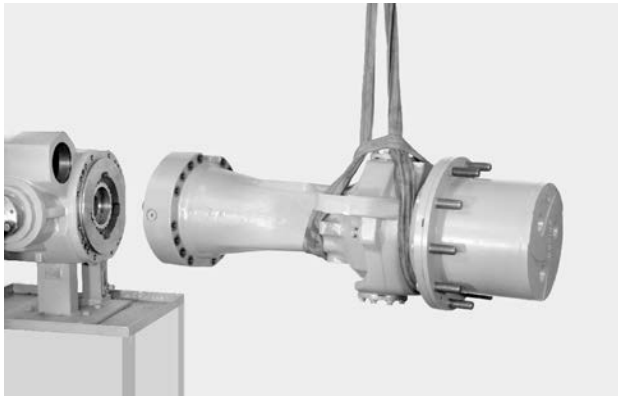


# DISASSEMBLY

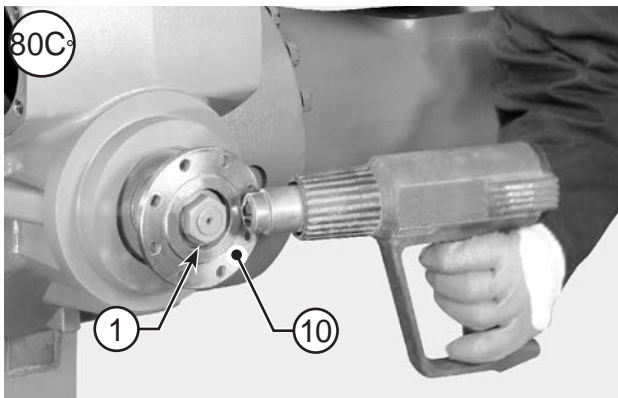
## DISASSEMBLY

### ⚠ CAUTION

Before draining oil, release the internal pressure, for details see OIL DRAINING MANDATORY PROCEDURE p. 12.



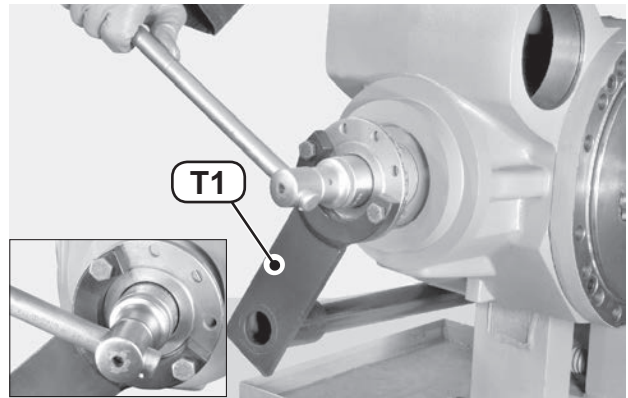
**FIGURE 1:** Remove both axle arms.



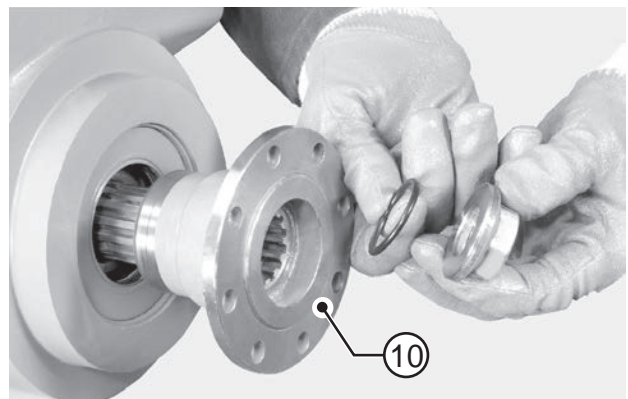
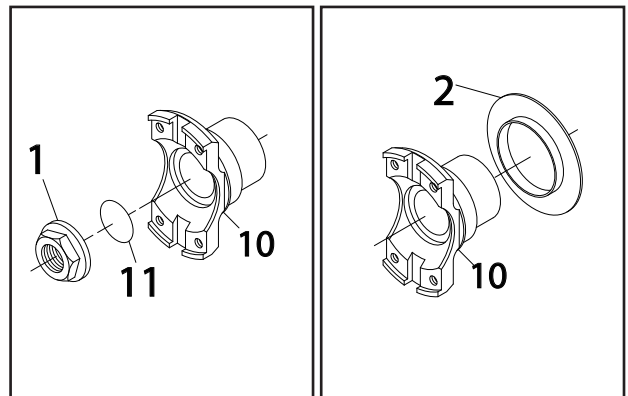
**FIGURE 2:** If disassembly is difficult, heat the check nut (1) of the flange (10) to 176 °F [80 °C].

### NOTE:

Heat will loosen the setting of Loctite on the nut (1).

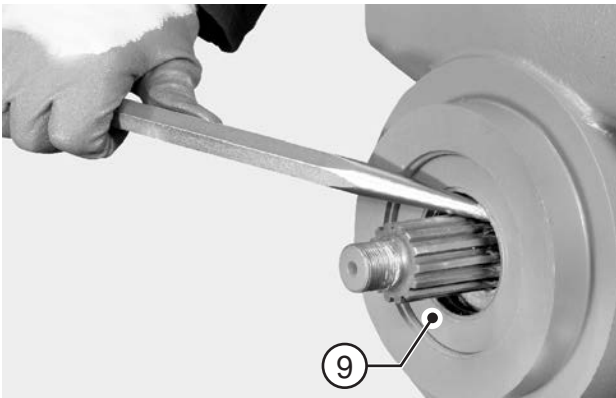


**FIGURE 3:** Position tool T1 (See drawing T1 p. 90), so as to avoid pinion rotation. Loosen and remove the nut (1) and o-ring (11).

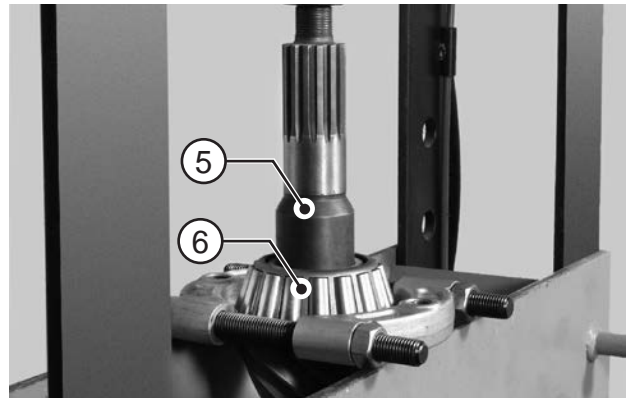


**FIGURE 4:** Remove the flange (10) complete with guard (2).

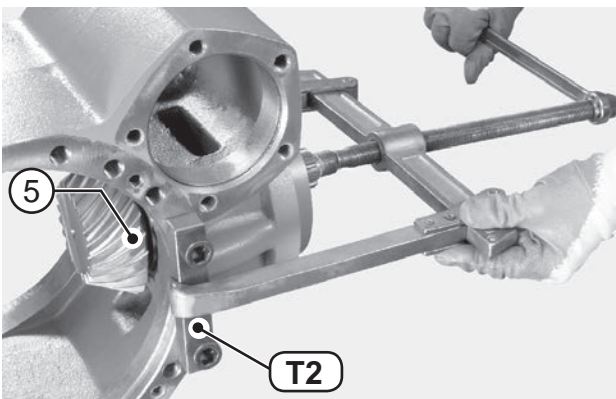




**FIGURE 5:** Remove the sealing ring (9).



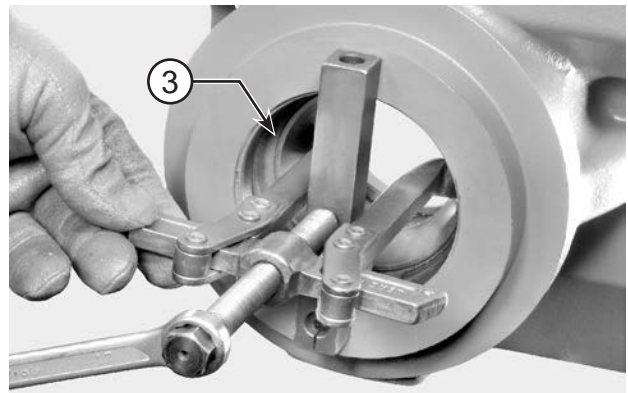
**FIGURE 8:** Using a puller and a press, remove the inner bearing (5) from the pinion (6).



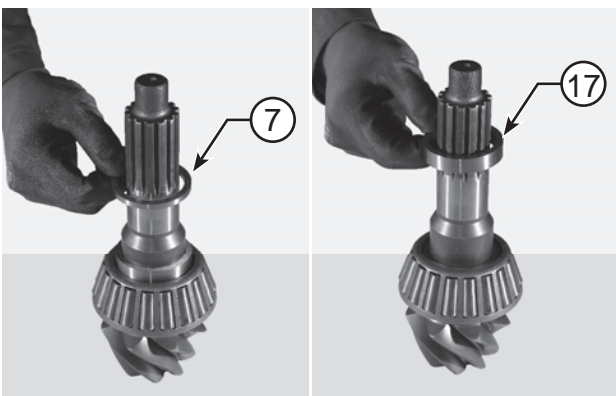
**FIGURE 6:** Apply blocks T2 (See drawing T2 p. 91) and, with the help of a puller, extract the pinion (5) complete with the internal bearing (6), the spacer (8), and calibrated spacer (4, 7).

**NOTE:**

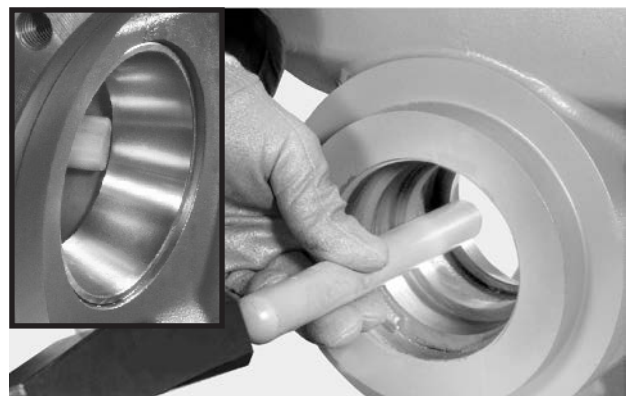
The thrust blocks of the bearings remain in the central body (12).



**FIGURE 9:** Remove the thrust block of the external bearing (3).

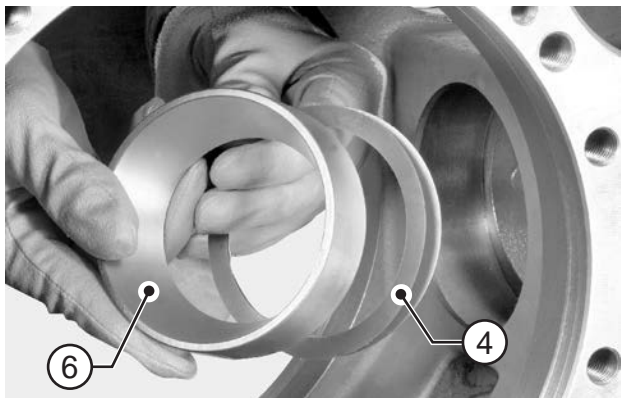


**FIGURE 7:** Remove spacer (17) and calibrated spacer (7).

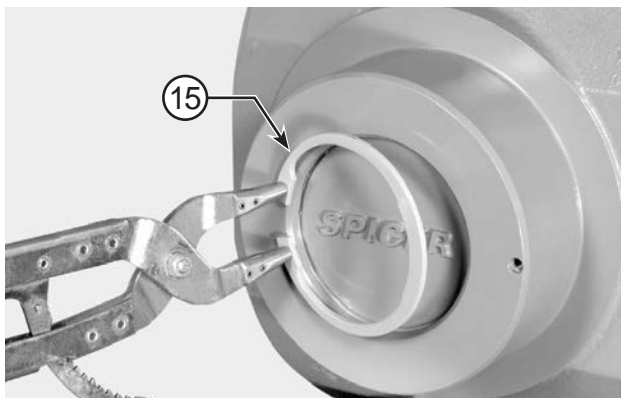


**FIGURE 10:** Insert a drift in the appropriate holes.

## DISASSEMBLY



**FIGURE 11:** Remove the thrust block of the internal bearing (6) as well as the shim washers (4).



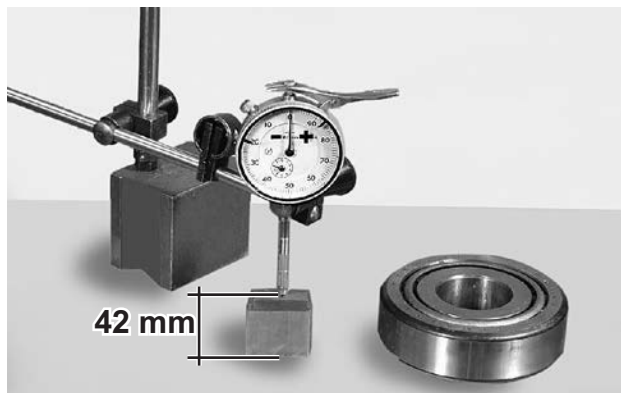
**FIGURE 12:** Remove the snap ring (15).



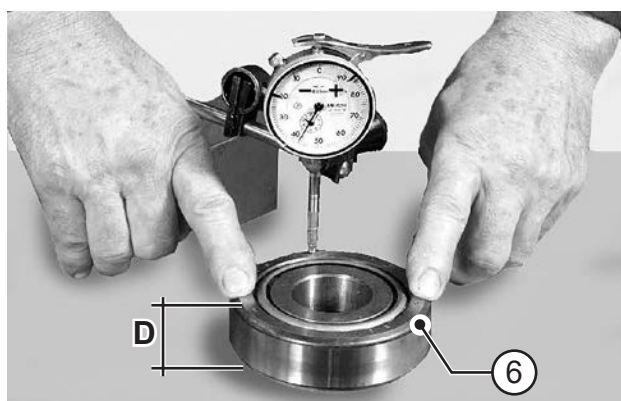
**FIGURE 13:** Remove the cap (14).



## ASSEMBLY



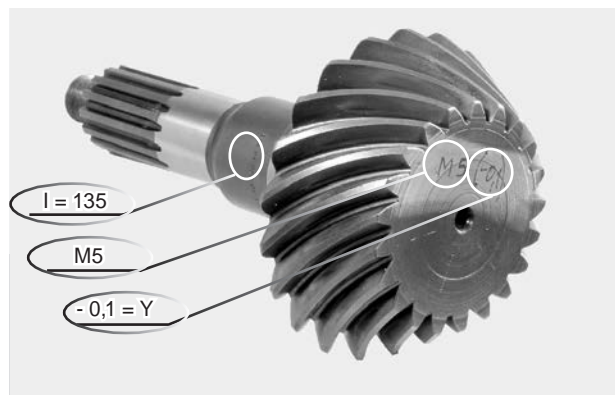
**FIGURE 14: CALCULATING PINION CENTER stud**  
Using a faceplate, reset a dial indicator “DG” on a calibrated block (whose known thickness is 42 mm.). Preload the gauge by about 3 mm.



**FIGURE 15: Bring inner bearing (6), complete with thrust block, under gauge “DG”.**  
EXAMPLE:  $42 + 0.5 = 42.5 = “D”$ .

### ⚠ CAUTION

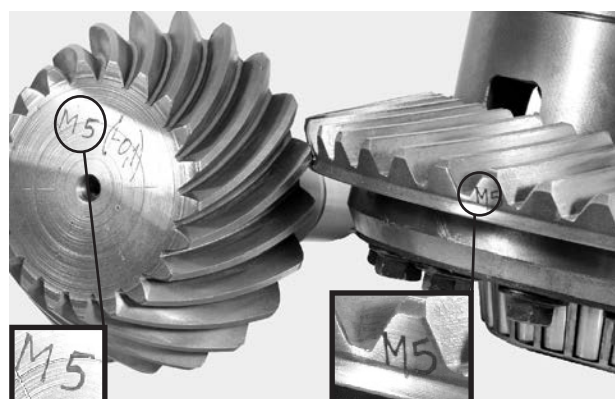
Press the thrust block centrally and carry out several measurements by rotating the thrust block.



**FIGURE 16: Check nominal dimension “I” as marked on the pinion.** Add up to or subtract from “I” the variation indicated as “Y” to obtain the actual center stud “I”.  
EXAMPLE:  $I = 135 - 0.1 = 134.9$

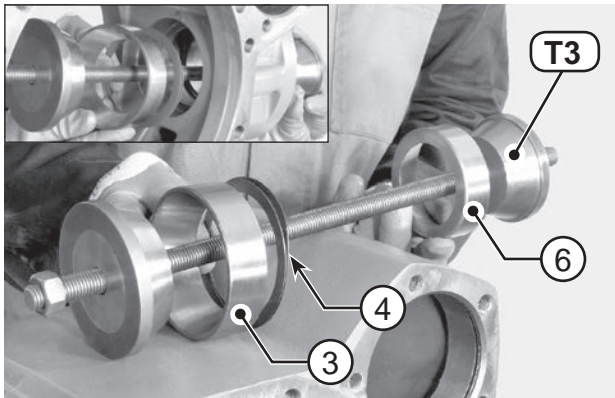
### NOTE:

**M5 = Match part number**

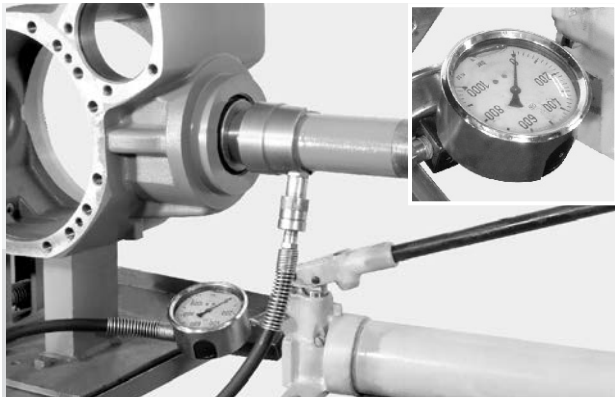


**FIGURE 17: Calculate shims “S” for insertion under the thrust block of the inner bearing using the following formula:**  
 $S = 178 - (I + D)$   
where: 178 = fixed dimension;  
I = actual pinion center stud;  
D = total bearing thickness;  
EXAMPLE:  $S = 178 - (134.9 + 42.5) = 0.6 \text{ mm.}$

# ASSEMBLY



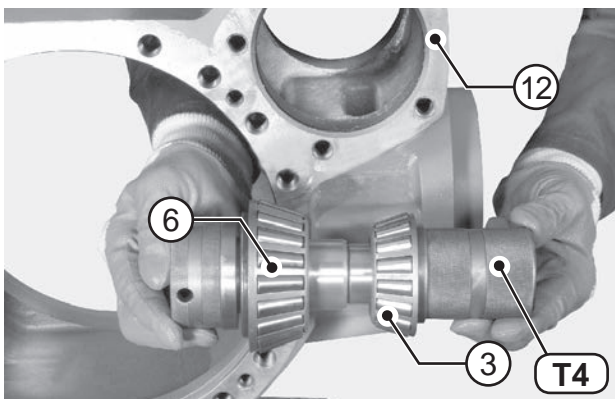
**FIGURE 18:** Using special tool T3 (See drawing T3 p. 91) partially insert the thrust block of the bearings (3, 6) and shims (4).



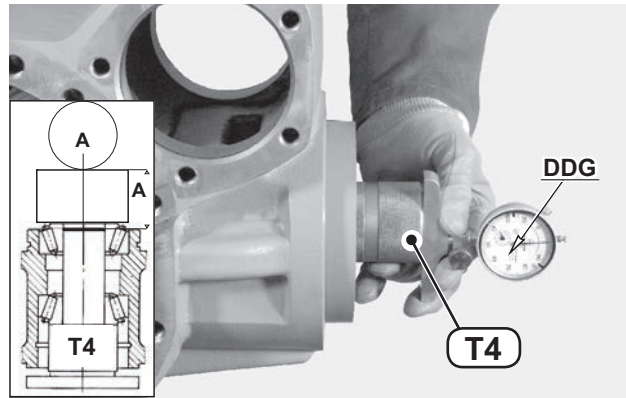
**FIGURE 19:** Connect the tension rod to the press and move the thrust block of bearings (3, 6) into the seats. Disconnect the press and remove the tension rod.

## NOTE:

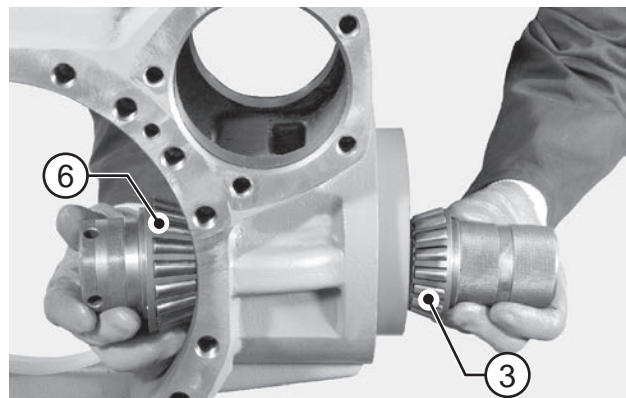
**Before starting the next stage, make sure that the thrust block has been completely inserted into its seat.**



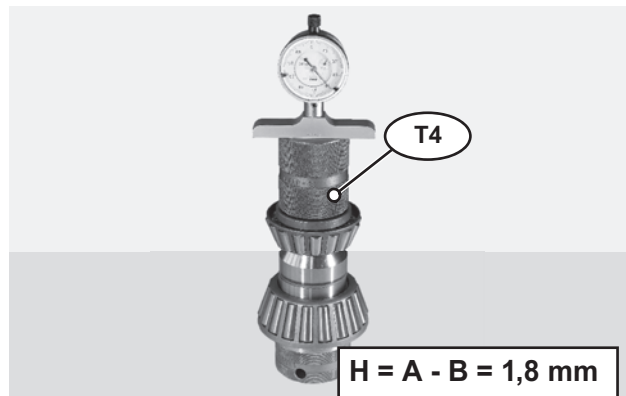
**FIGURE 20: CALCULATING PINION BEARINGS ROLLING TORQUE**  
Introduce tool T4 (See drawing T4 p. 92) complete with bearings (3) and (6) into the main body (12); tighten by hand until a rolling torque is definitely obtained.



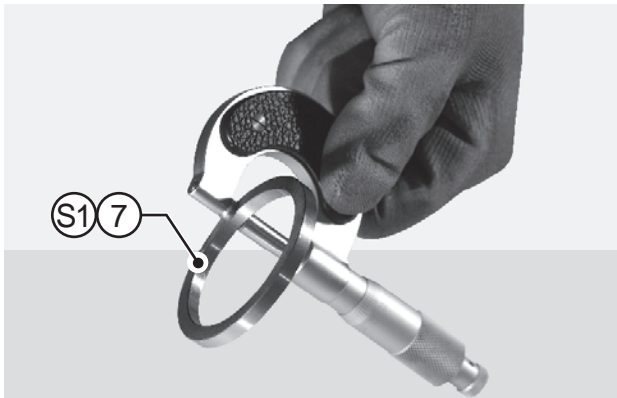
**FIGURE 21:** Introduce the tracer of a depth gauge “DDG” into either side hole of tool T4 (See drawing T4 p. 92). Reset the gauge with a preload of about 3 mm.



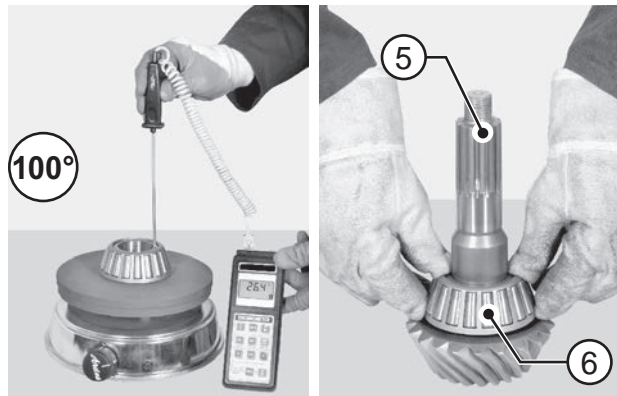
**FIGURE 22:** Remove the gauge and take out tool and bearing kits from the main body. Reinstall every part, also introducing a spacer between bearings (3) and (6). Tighten the entire pack by hand.



**FIGURE 23:** Introduce depth gauge “DDG” in tool T4 (See drawing T4 p. 92) and measure deviation “H” from the previous reset.  
EXAMPLE:  $H = A - B = 1,8 \text{ mm}$ .



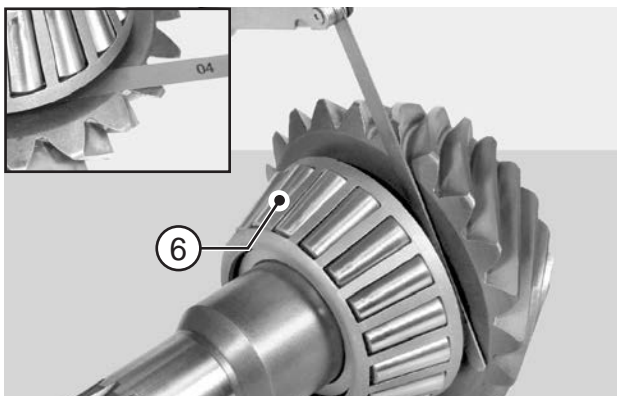
**FIGURE 24:** Deviation “H” must be added to a set value of 0.12--0.13 mm (X) to obtain calibrated spacer “S1” (7) for insertion between inner bearing (6) and spacer (8). Dimension “S1” must be rounded off to the higher 5/100. EXAMPLE:  $S1 = H + X = 1,8 + (0.12 - 0.13) = 1,92 - 1,93 \text{ mm}$ .



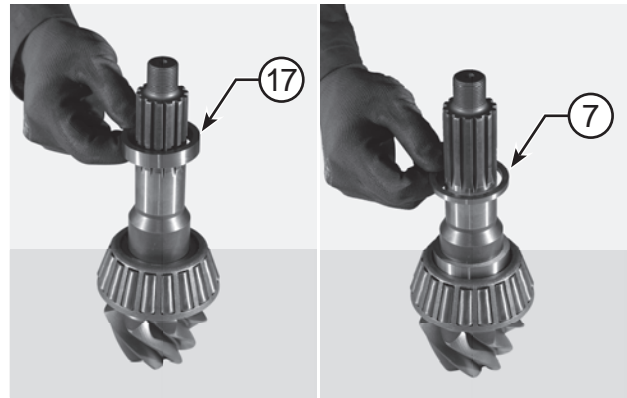
**FIGURE 25:** Heat the inner bearing (6) to about 212 °F [100 °C] and fit it onto the pinion (5).

**NOTE:**

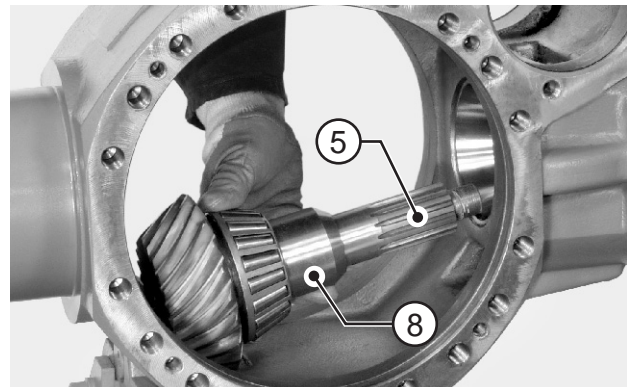
Once the bearing has cooled down, lightly lubricate bearing (6) with SAE85W90 oil.



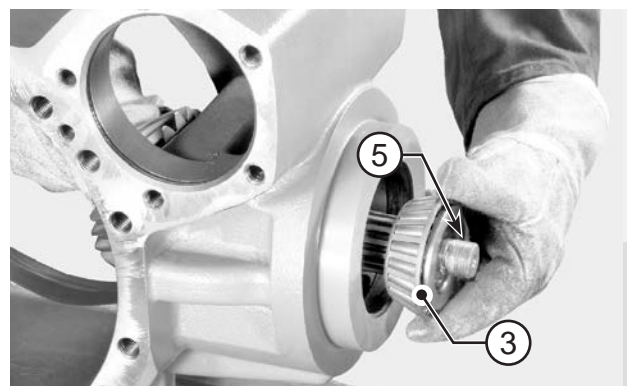
**FIGURE 26:** Make sure that the bearing (6) is well set.



**FIGURE 27:** Refer and keep to the positions marked during disassembly.



**FIGURE 28:** Fit the pinion (5), calibrated spacer “S1” (7) and spacer (8) in the main body (12).



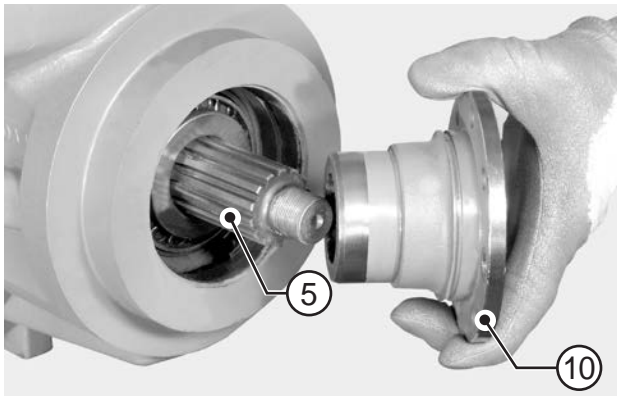
**FIGURE 29:** Heat the external bearing (3) to a temperature of about 212 °F [100 °C] and fit it on to the pinion (5) to complete the pack as shown in the figure above.

**NOTE:**

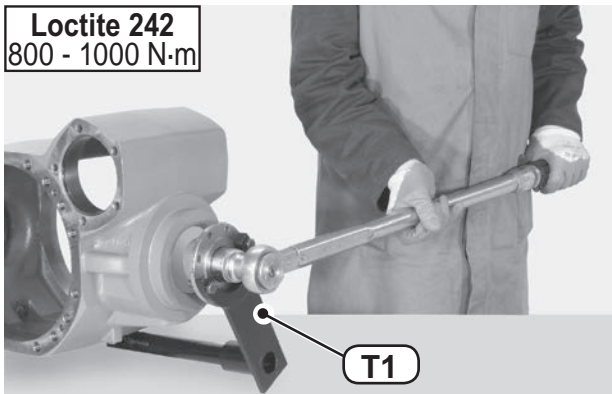
Lightly lubricate bearing (3) with SAE85W90 oil.



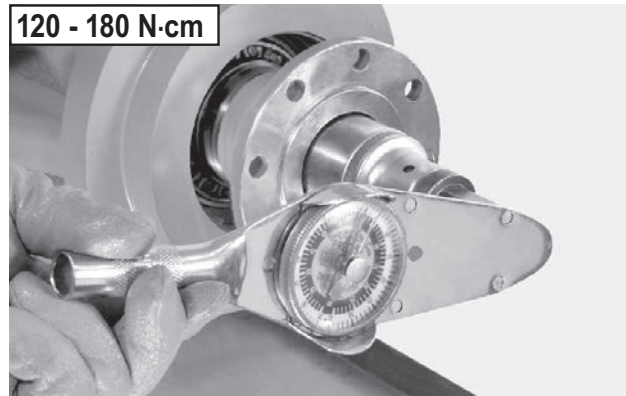
# ASSEMBLY



**FIGURE 30:** Install the flange (10) onto the pinion (5) without the sealing ring.



**FIGURE 31:** Apply wrench to the ring nut (1) and bar-hold T1 (See drawing T1 p. 90) to the pinion (5). Lock the wrench T1 (See drawing T1 p. 90) and rotate the pinion using a torque wrench, up to a minimum required torque setting of 800 - 1000 N·m.



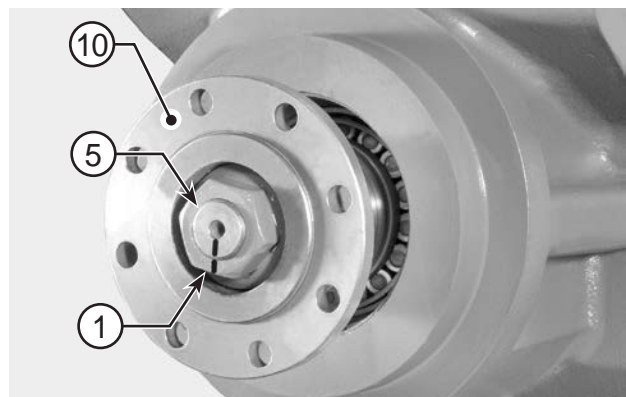
**FIGURE 32:** Apply onto the pinion (5) the bar-hold and with the help of a torque meter, check the torque of the pinion (5). Torque: 120 - 180 N·cm

## ⚠ CAUTION

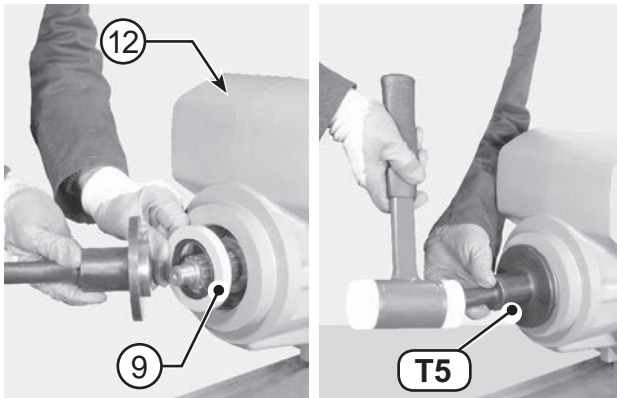
If torque exceeds the maximum value, then the size of calibrated spacer "S1" (7) between the bearing (6) and the spacer (8) needs to be increased. If torque does not reach the set value, increase the torque setting of the ring nut (1) in different stages to obtain a maximum value of 800 - 1000 N·m.

If torque does not reach the minimum value, then the size of calibrated spacer "S1" (7) needs to be reduced.

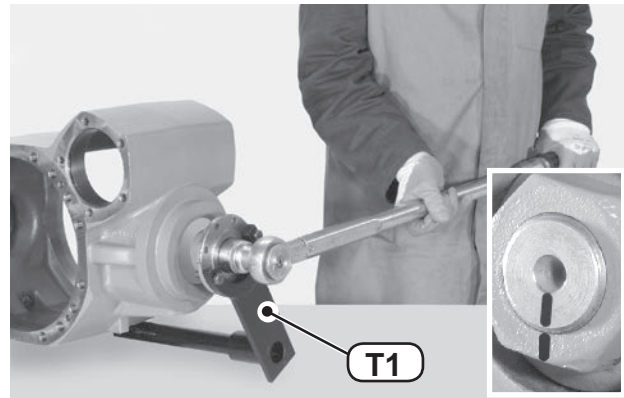
When calculating the increase or decrease in size of calibrated spacer "S1", bear in mind that a variation of calibrated spacer (4) of 0.01 mm corresponds to a variation of 60 N·cm in the torque of the pinion (5).



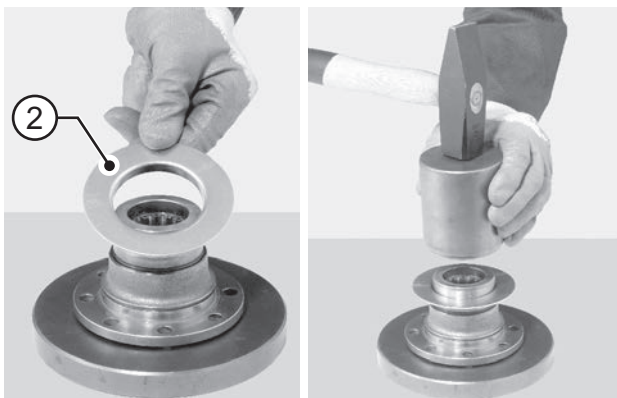
**FIGURE 33:** Make positional marks across nut (1) and pinion (5) tang; then remove nut and flange (10)



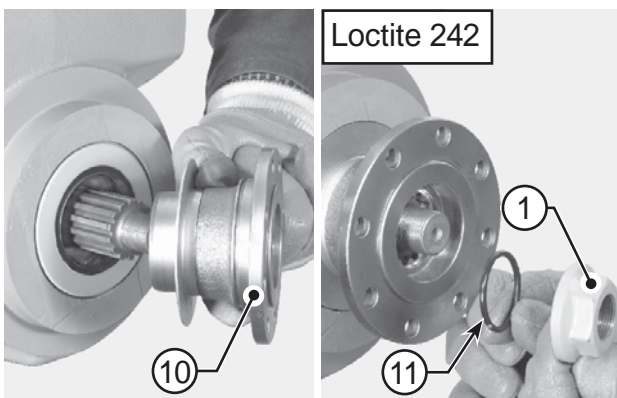
**FIGURE 34:** Apply Arexons rubber cement to the outer surface of the new seal ring (9) and fit ring in the main body (12) using driver T5 (See drawing T5 p. 93).



**FIGURE 37:** Tighten the nut until the match marks line up.



**FIGURE 35:** Fit the safety flange (2).



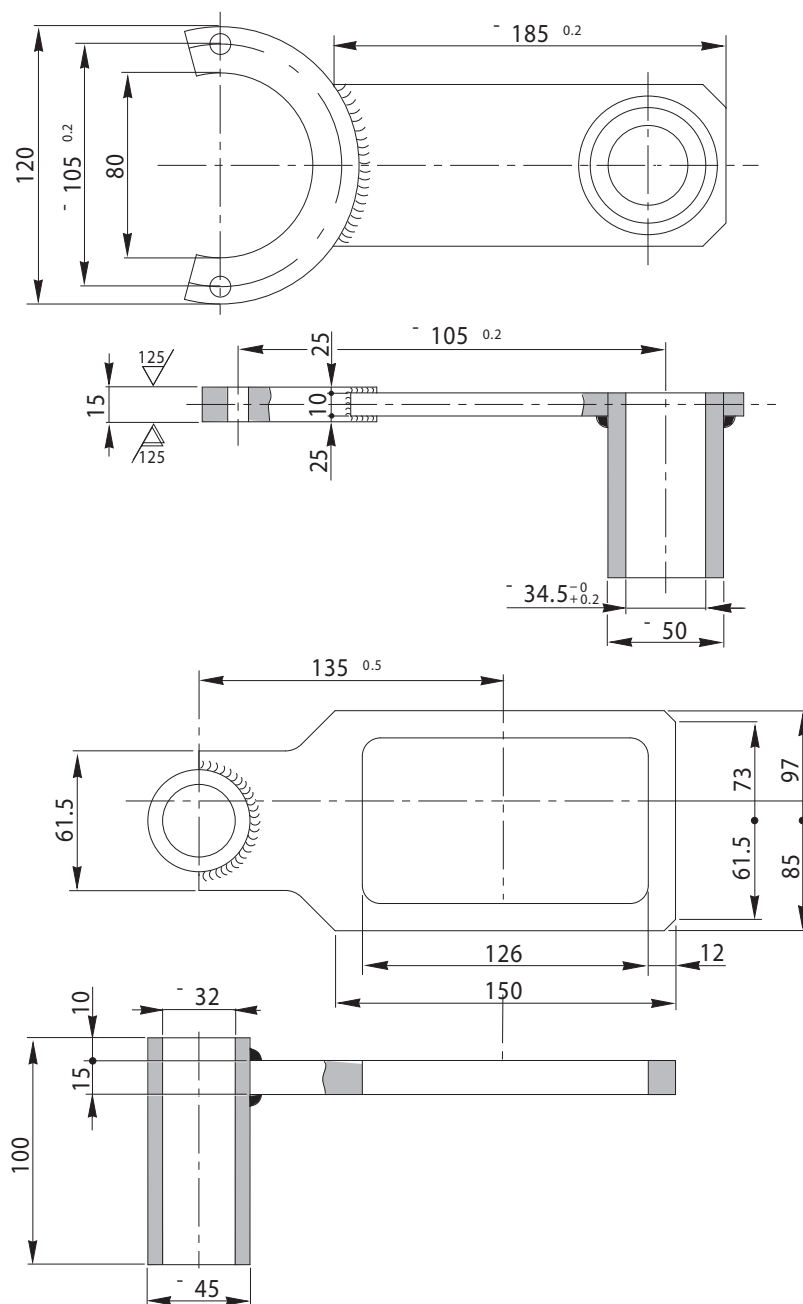
**FIGURE 36:** Oil seal ring lips and install flange (10). Mount o-ring (11) and apply Loctite 242 to pinion tang; tighten nut (1).

# SPECIAL TOOLS

## SPECIAL TOOLS

T1

P/N: 2308



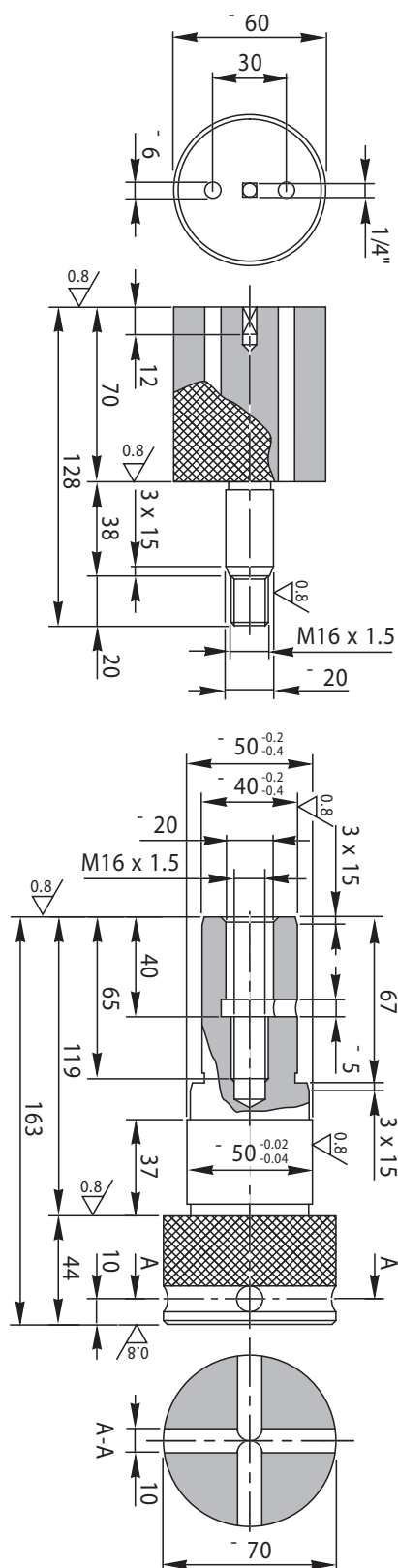


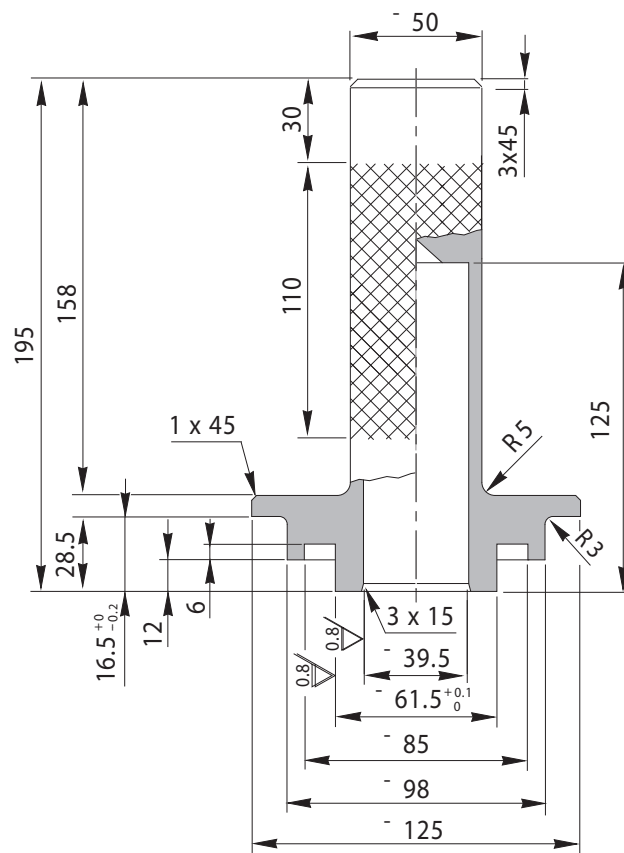


# SPECIAL TOOLS

T4

P/N: 2374

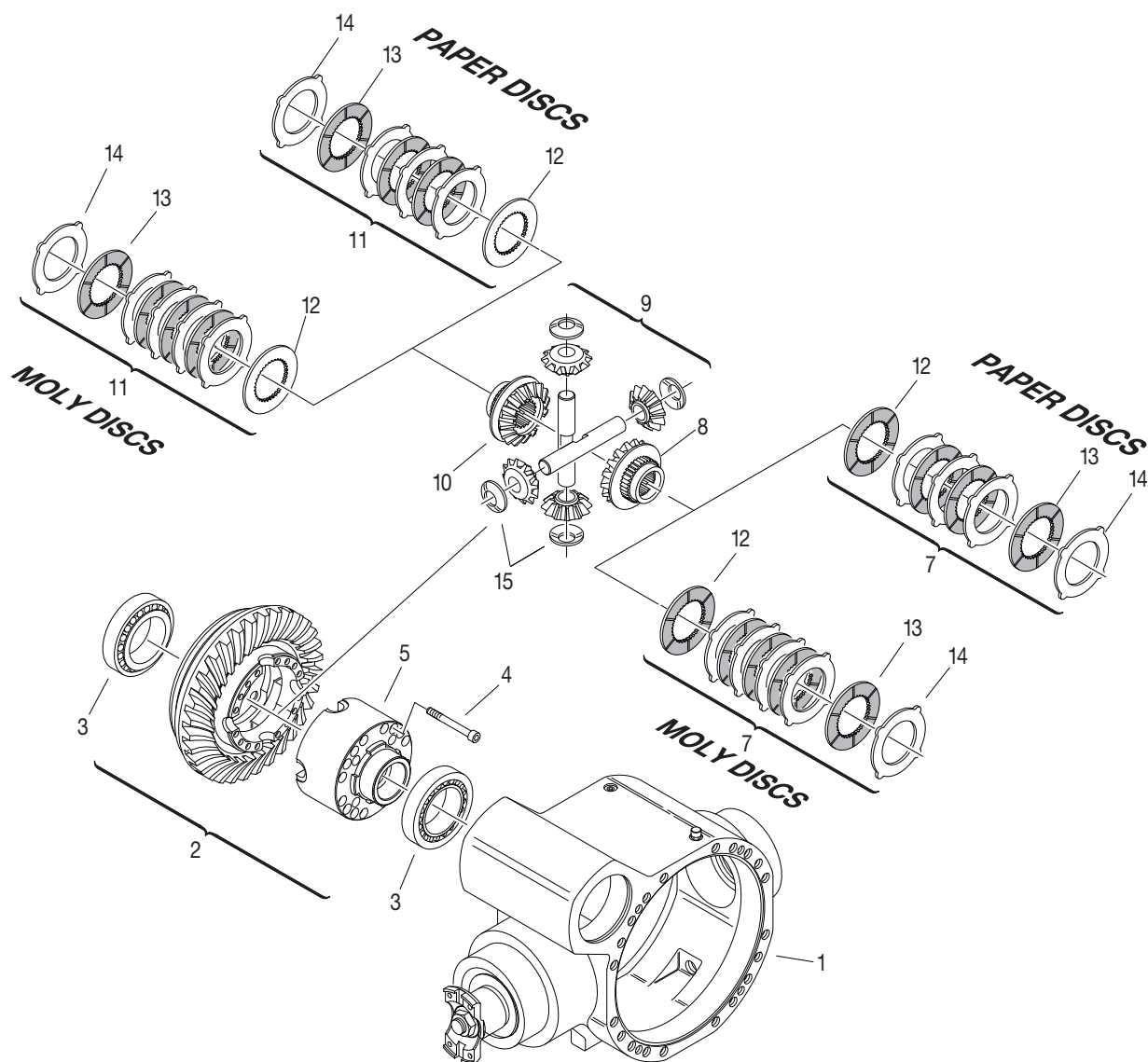




## SPECIAL TOOLS

# LIMITED SLIP DIFFERENTIAL UNIT

## EXPLODED VIEW

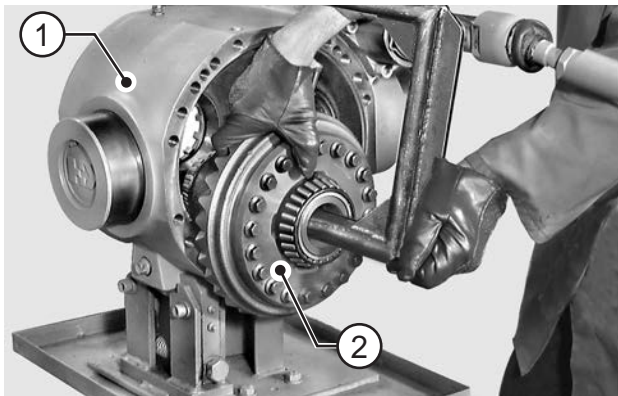


# DISASSEMBLY

## DISASSEMBLY

### ⚠CAUTION

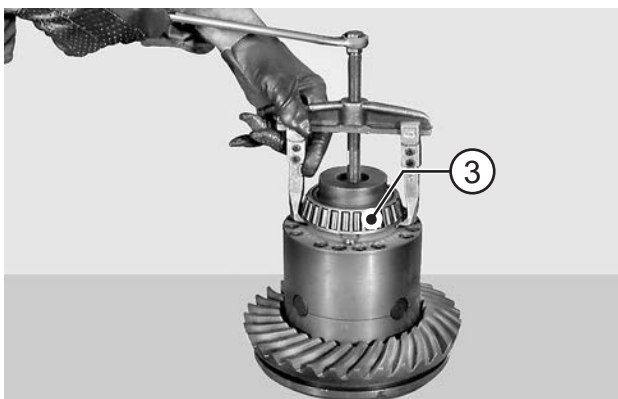
Before draining oil, release the internal pressure, for details see OIL DRAINING MANDATORY PROCEDURE p. 12.



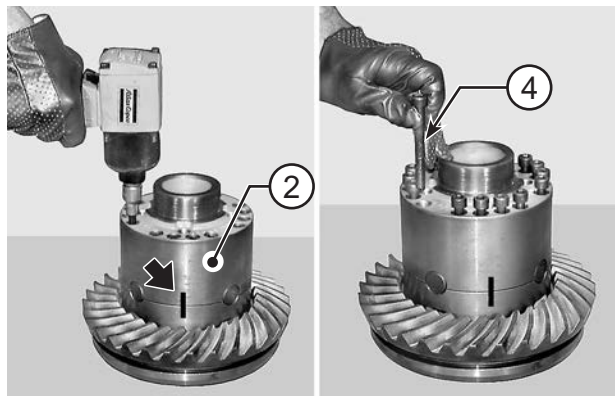
**FIGURE 1:** Remove the whole differential unit (2) from the main body (1).  
(For details, see DIFFERENTIAL UNIT p. 69).

### ⚠CAUTION

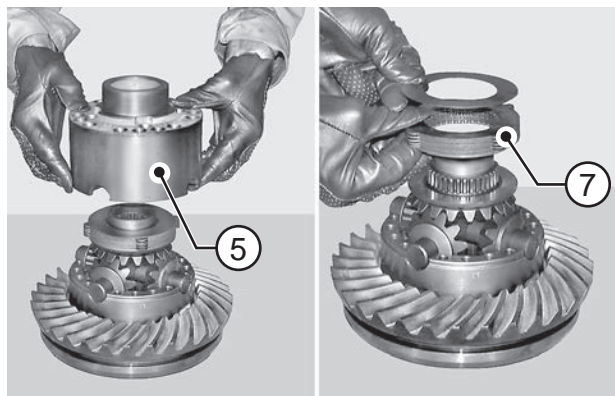
The following section includes clutch replacement procedures only; for gear ring replacement, see DIFFERENTIAL UNIT p. 69.



**FIGURE 2:** Using a puller, remove bearing (3).



**FIGURE 3:** Make positional match marks on the half boxes of the differential gear (2); loosen and pull out joining screws (4).



**FIGURE 4:** Remove the upper half box (5) and clutch pack (7).

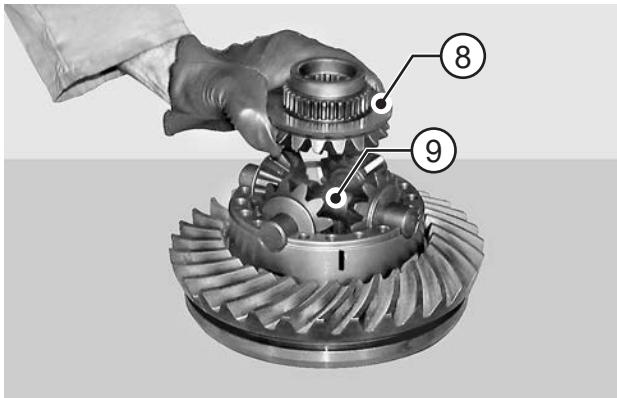
### ⚠CAUTION

Check and write down the amount of differential discs.  
In function of this quantity deduce the type of material:  
8 discs - friction material "PAPER"  
10 discs - friction material "MOLY"

### ⚠CAUTION

If the clutch pack does not need replacing, avoid swapping discs position.

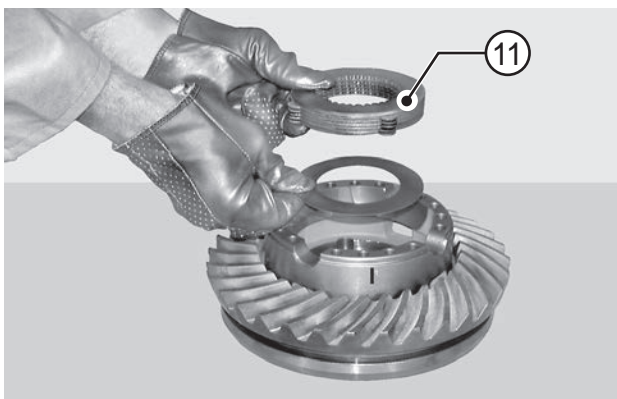




**FIGURE 5:** Remove the crown wheel (8) and planetary gears set (9).



**FIGURE 6:** Remove the 2nd planetary gear (10).



**FIGURE 7:** Remove the 2nd clutch pack (11) .

## ⚠ CAUTION

If the clutch pack does not need replacing, avoid swapping discs position.

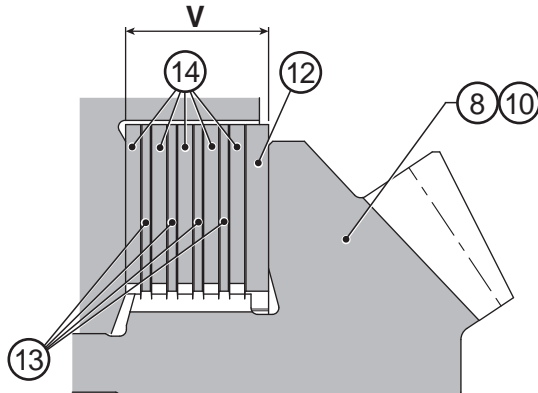
## ⚠ CAUTION

Check and write down the amount of differential discs.  
In function of this quantity deduce the type of material:  
8 discs - friction material "PAPER"  
10 discs - friction material "MOLY"

# ASSEMBLY

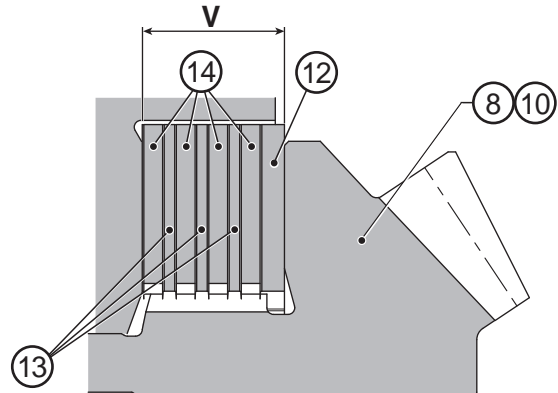
## ASSEMBLY

### “MOLY” FRICTION DISCS



**FIGURE 8:** Check the disc pack thickness “V” applying 3000 N  $\pm$  5%.  
“V” measurement must be  $17,4 \pm 0,08$  mm.

### “PAPER” FRICTION DISCS



**FIGURE 9:** Check the disc pack thickness “V” applying 3000 N  $\pm$  5%.  
“V” measurement must be 17,35 - 17,50 mm.

#### ⚠ CAUTION

Dip the complete disc pack in oil (with LS additive) at least one hour before to assembly, for details about oil see OIL DRAINING MANDATORY PROCEDURE p. 12.

#### 📌 NOTE:

Check the total dimension of the disc pack before installing, if this measurement does not respect the predefined value install a new disc pack.

New disc pack doesn't need measurement, because, supplied as subassembly, they already respect the predefined value.

It is mandatory to install discs of the same material of the original installation.

#### ⚠ CAUTION

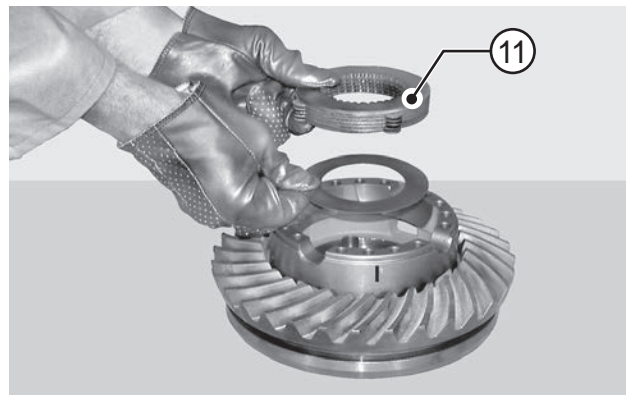
Dip the complete disc pack in oil (with LS additive) at least 24 hours before to assembly, for details about oil see OIL DRAINING MANDATORY PROCEDURE p. 12.

#### 📌 NOTE:

Check the total dimension of the disc pack before installing, if this measurement does not respect the predefined value install a new disc pack.

New disc pack doesn't need measurement, because, supplied as subassembly, they already respect the predefined value.

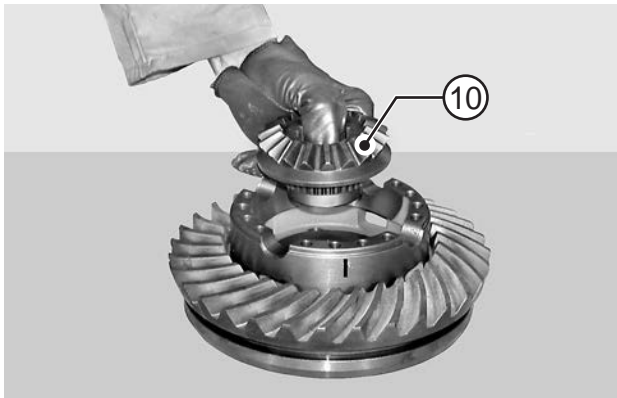
It is mandatory to install discs of the same material of the original installation.



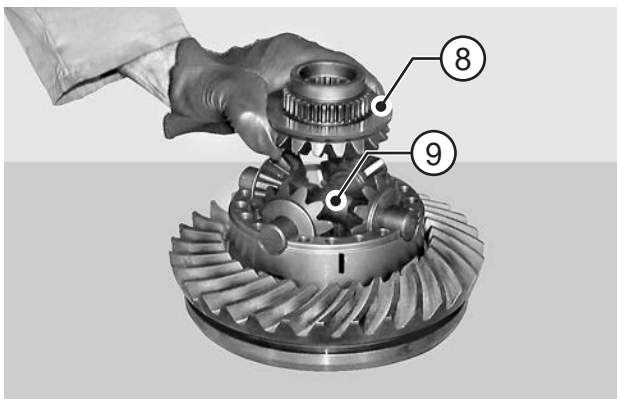
**FIGURE 10:** Fit the clutch pack (11) in the half-box.

#### ⚠ CAUTION

When installing the increased shim, place shim so that it leans against the crown wheel (8, 10).



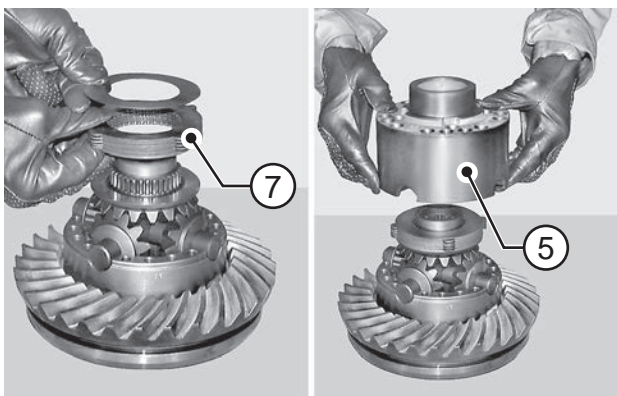
**FIGURE 11:** Install planetary gear (10).



**FIGURE 12:** Fit the planetary gear set (9).  
Mount second planetary gear (8).

**NOTE:**

**Make sure that spherical thrust washers (15) are present.**



**FIGURE 13:** Fit increased shim (12), clutch pack (7) onto the crown wheel (8).

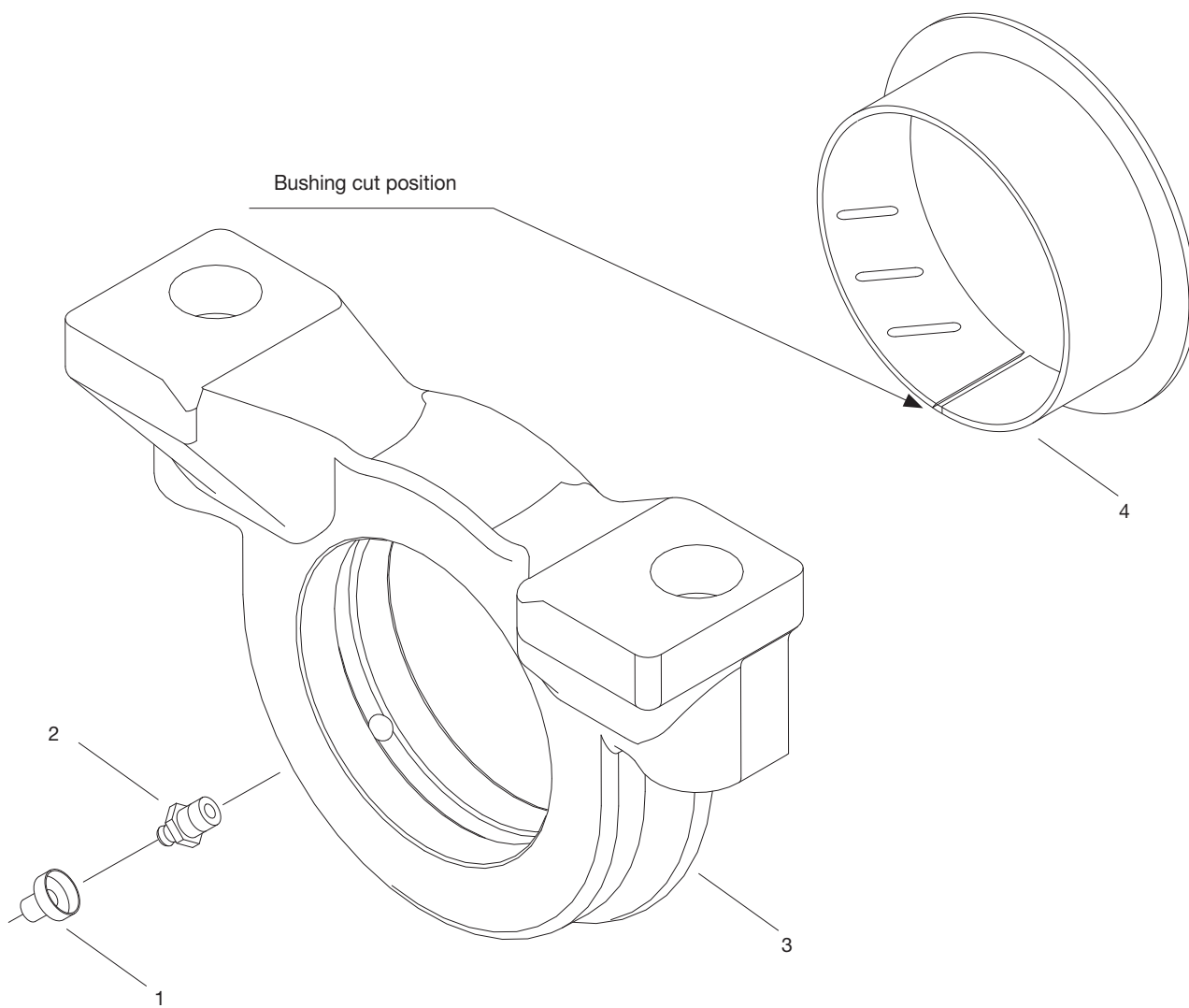
Fit the upper half box (5) and make sure that the match marks line up.

Complete the assembling operation and install the differential unit following the procedures described in the first part of the manual under section DIFFERENTIAL UNIT p. 69.



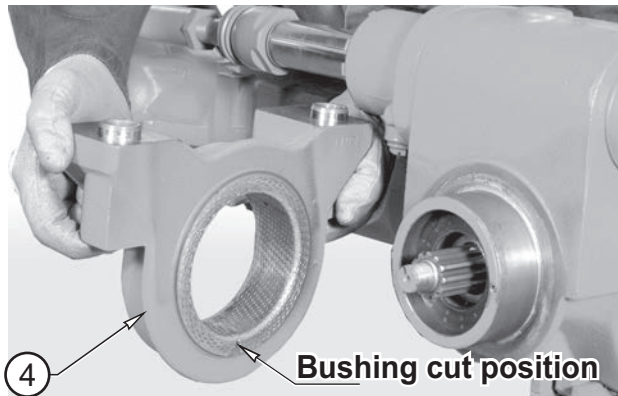
## SWINGING SUPPORT

### EXPLODED VIEW

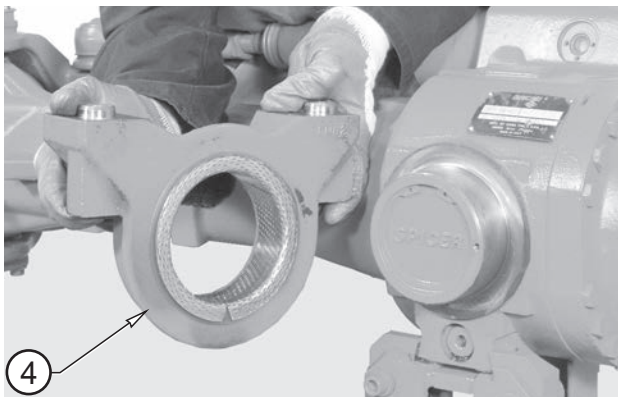


# DISASSEMBLY

## DISASSEMBLY



**FIGURE 1:** Remove the swinging support (4).



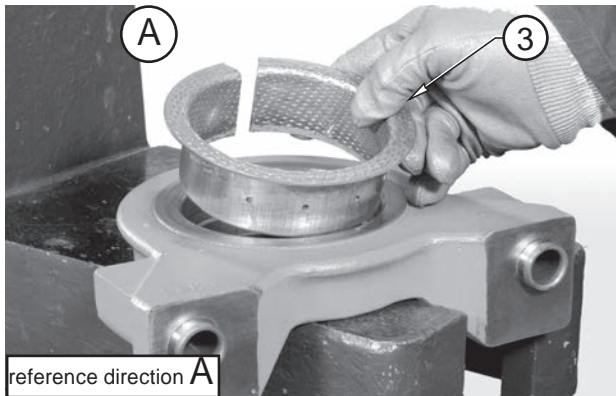
**FIGURE 2:** Remove the swinging support (4) on the side opposite the drive.



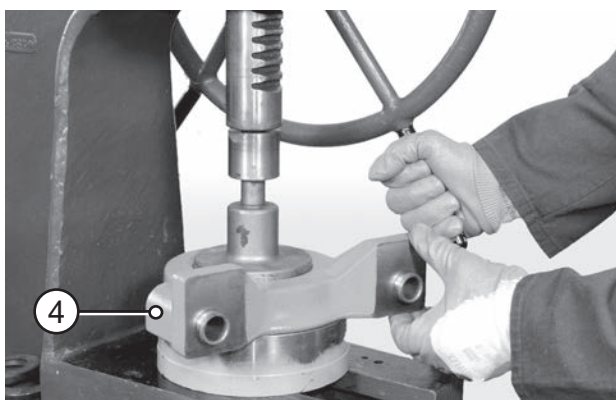
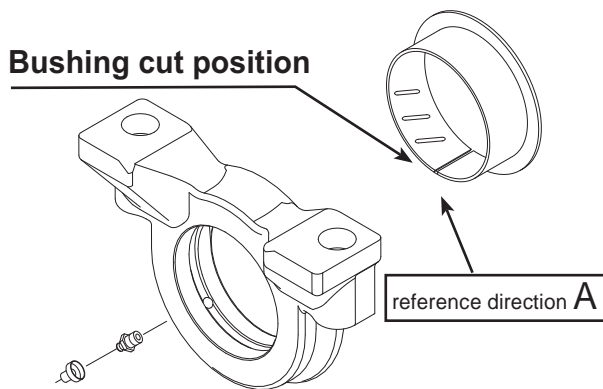
**FIGURE 3:** Position the swinging support (4) under a press and remove the complete bushing (3).



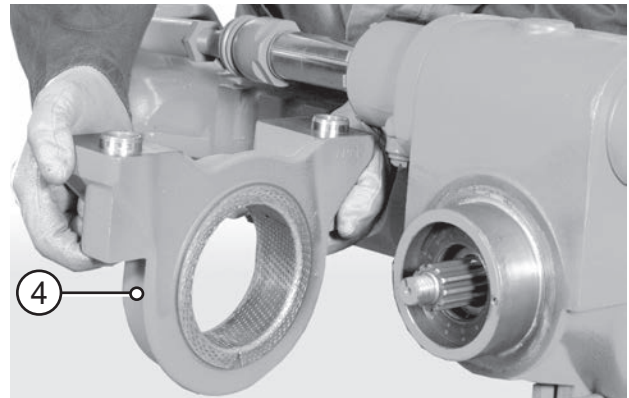
## ASSEMBLY



**FIGURE 4:** If the bushing (3) is worn and needs replacing, write down the assembly side of the connection notch “A”.



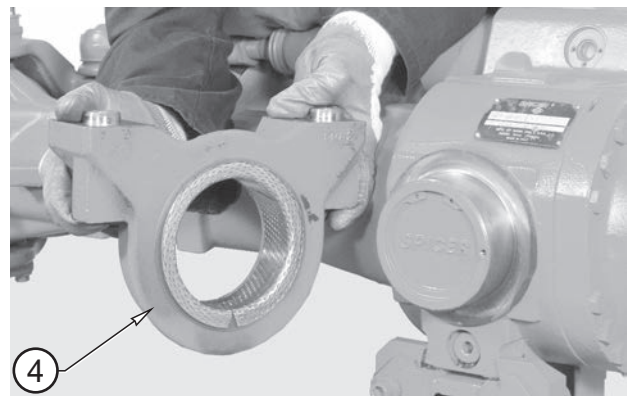
**FIGURE 5:** Position the swinging support (4) under a press and insert the complete bushing (3).



**FIGURE 6:** Install the swinging support (4).

**NOTE:**

**Check that it is properly oriented.**

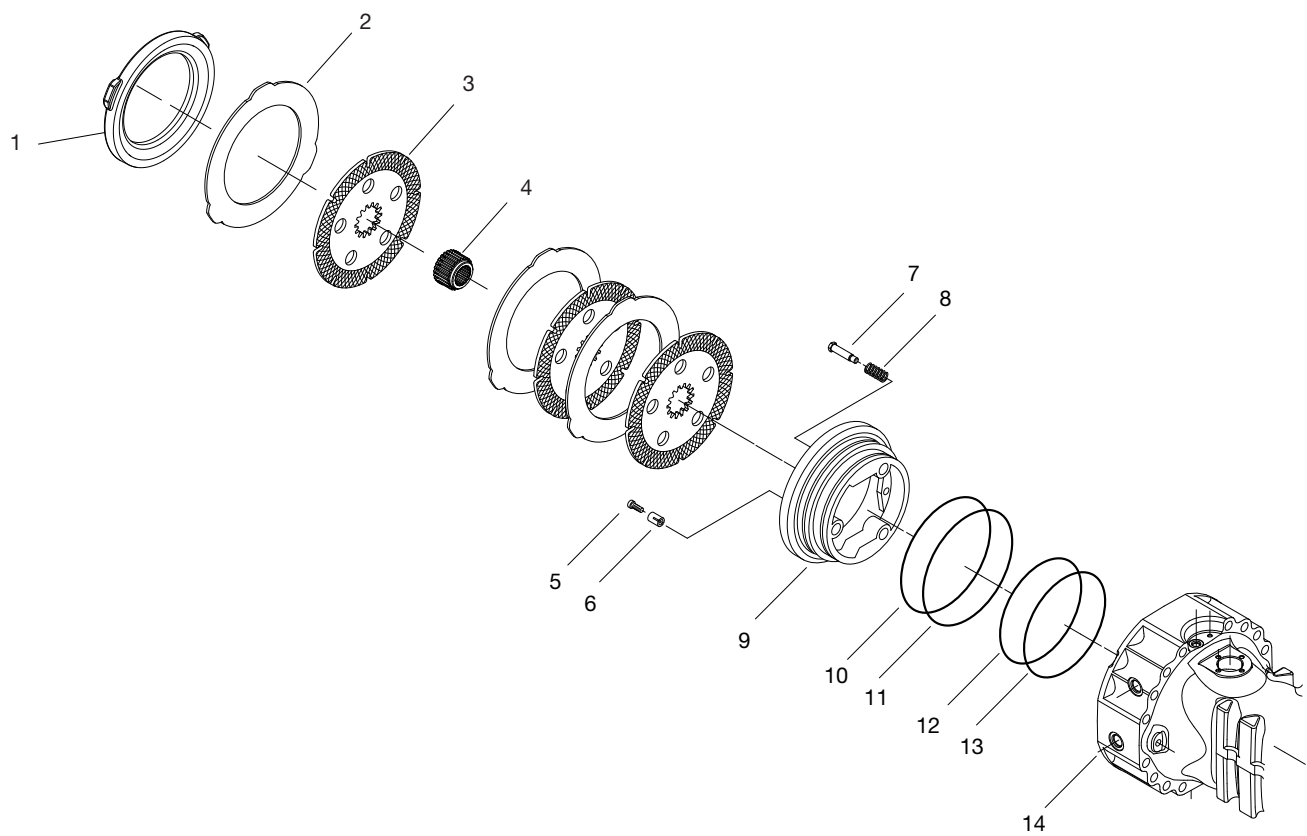


**FIGURE 7:** Install the swinging support (4) on the side opposite the drive.



# SERVICE BRAKE

## EXPLODED VIEW



# DISASSEMBLY

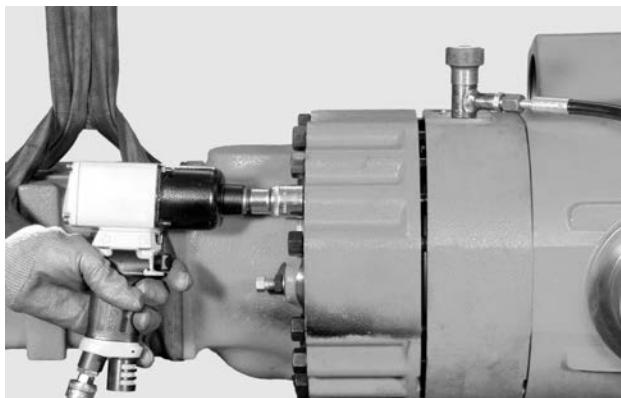
## DISASSEMBLY

### DANGER

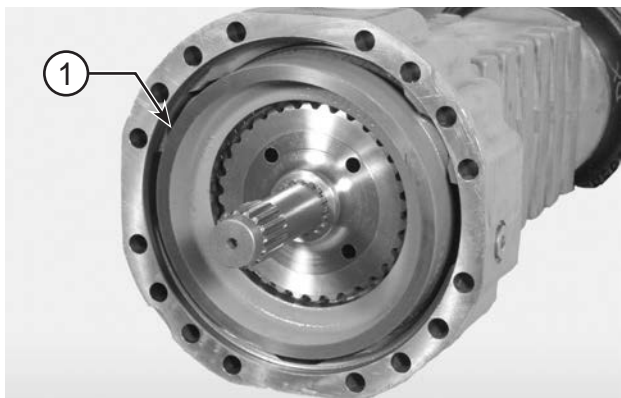
Before maintaining brakes, when the axle is installed on the vehicle, follow all safety instructions in the Original Equipment Manufacturer (OEM) manual that came with the vehicle.

### CAUTION

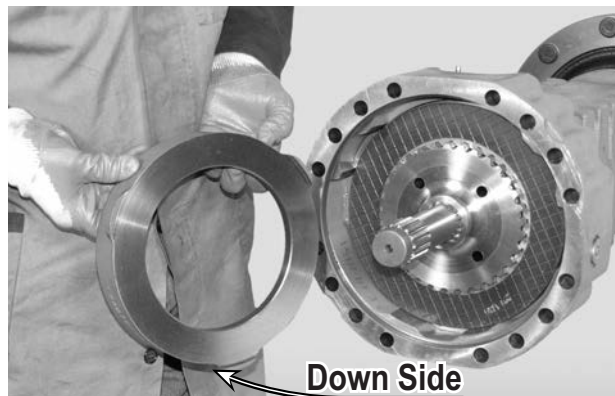
Before draining oil, release the internal pressure, for details see OIL DRAINING MANDATORY PROCEDURE p. 12.



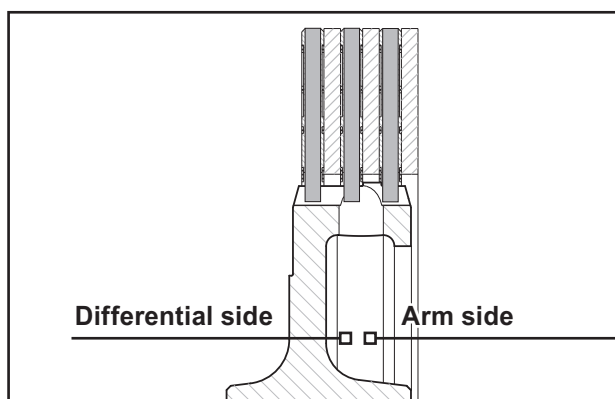
**FIGURE 1:** Sling the arm to be removed and connect it to a hoist. Loosen and remove screws.



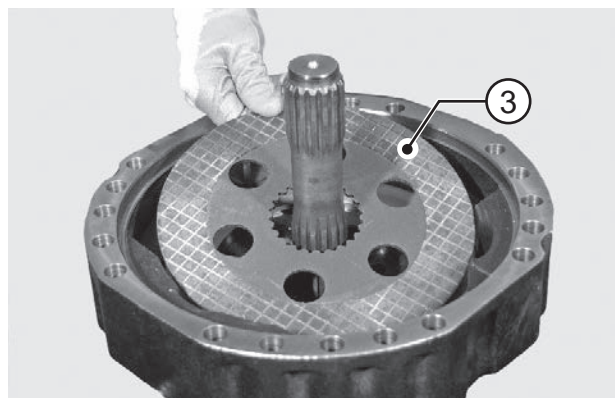
**FIGURE 2:** Write down the order of assembly and remove the counterwasher (1).



**FIGURE 3:** Write down the counterwasher (1) position.



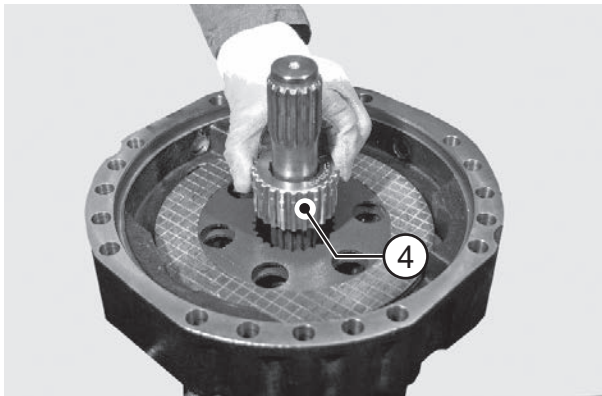
**FIGURE 4:** Write down the flange (4) position.



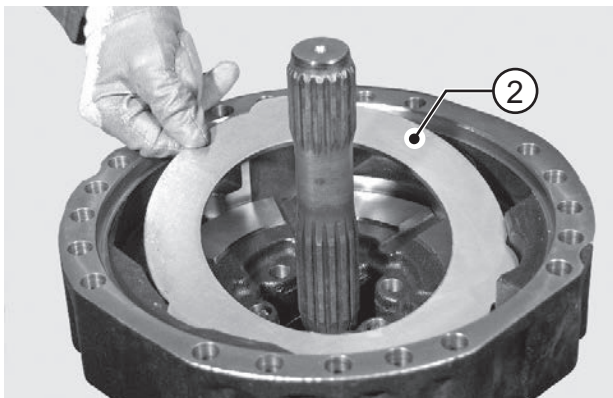
**FIGURE 5:** Remove braking discs (2, 3), noting down direction of assembly.

### NOTE:

If disks are not to be replaced, avoid changing their position.



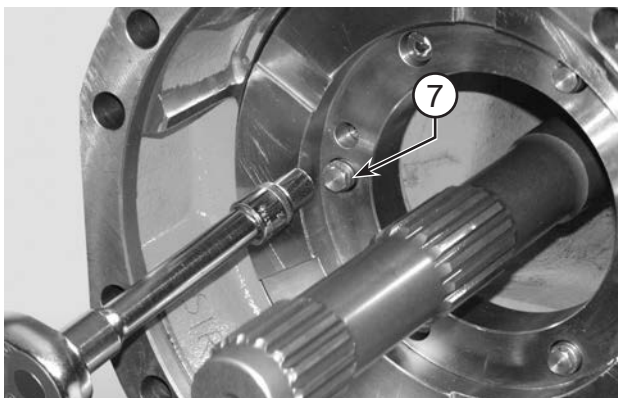
**FIGURE 6:** Remove the flange (4) complete with the discs.



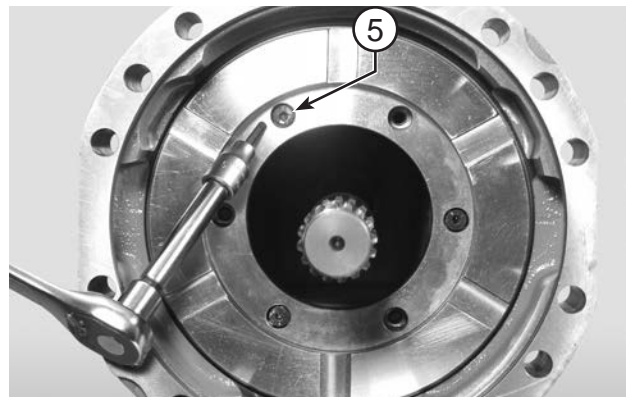
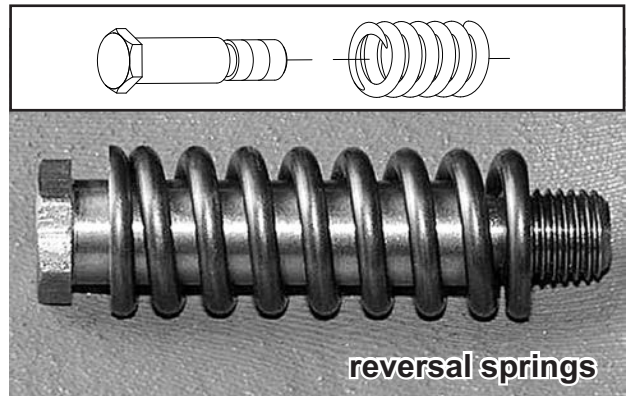
**FIGURE 7:** Remove braking discs (2, 3), noting down direction of assembly.

**NOTE:**

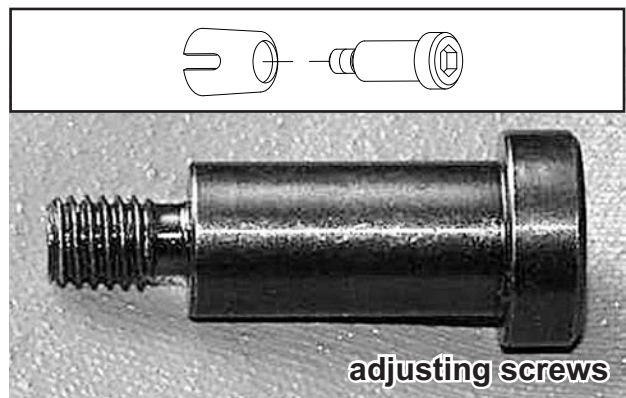
If disks are not being replaced, avoid changing their position.



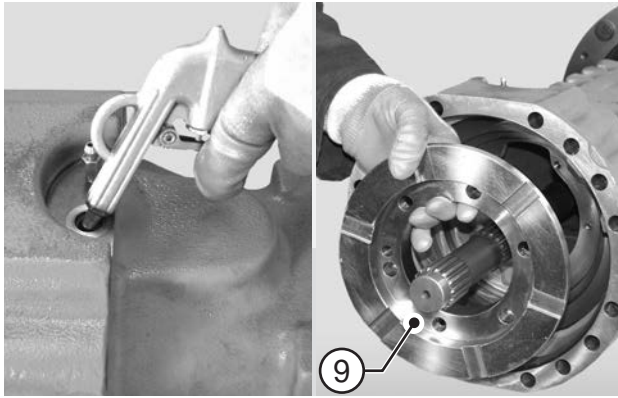
**FIGURE 8:** Remove the reversal springs (7)



**FIGURE 9:** Remove the adjusting screws (5)



## DISASSEMBLY



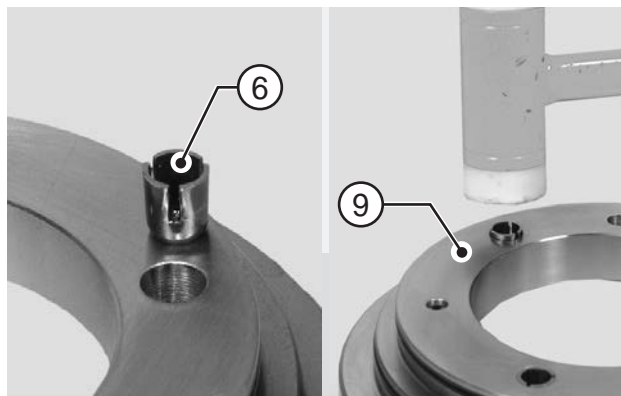
**FIGURE 10:** Slowly introduce low-pressure compressed air through the connection member for the service brake (P1), in order to extract the piston (9).

### **CAUTION**

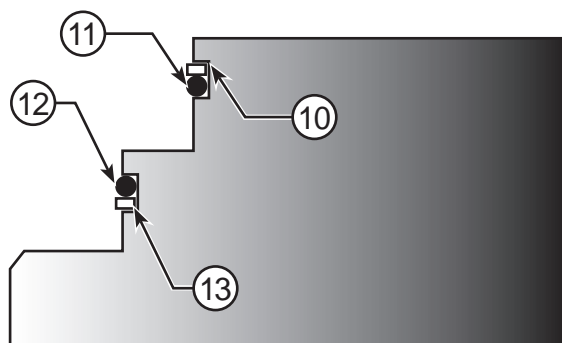
Hold the piston (9) back, as it may be suddenly ejected and damaged.



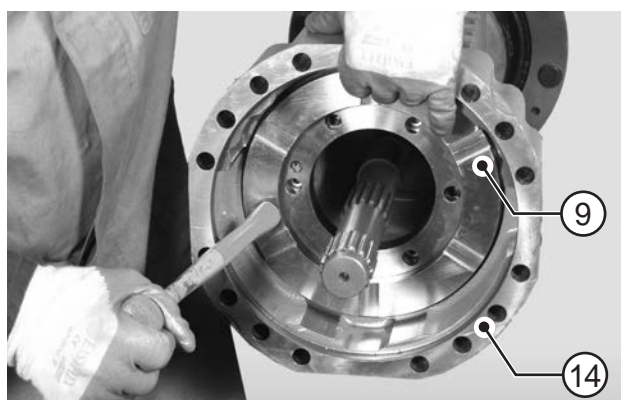
## ASSEMBLY



**FIGURE 11:** Insert the stroke automatic regulation springs (6); place them in line with the piston (9).



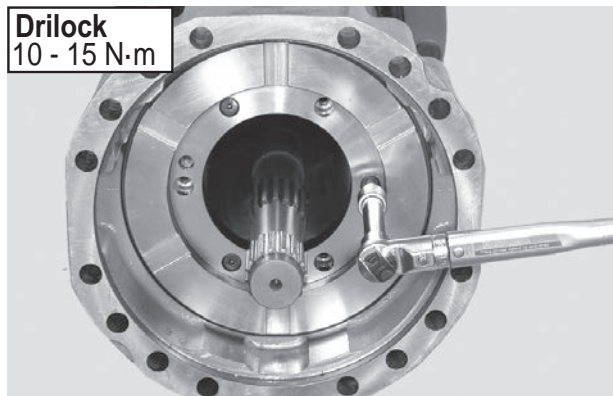
**FIGURE 12:** Fit o-ring (11, 12) and back-up ring (10, 13) onto the piston (11). Lubricate the piston and the o-rings and install the unit into the arm (14).



**FIGURE 13:** Using a plastic hammer, install the piston (9) into the arm (14).

### NOTE:

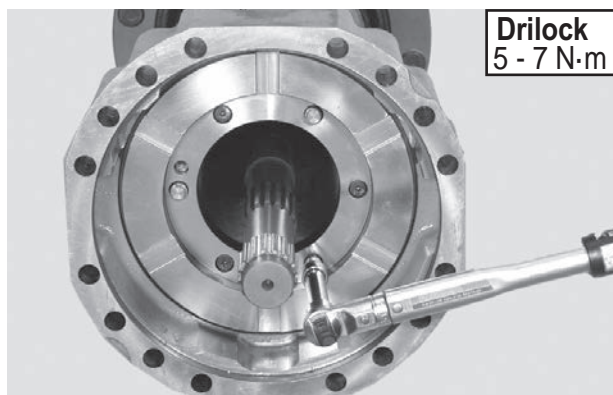
Lightly hammer all around the edge in an alternate sequence.



**FIGURE 14:** Fit the reversal springs screws (7) on the piston (9). Tighten with torque wrench setting of 10 - 15 N·m

### CAUTION

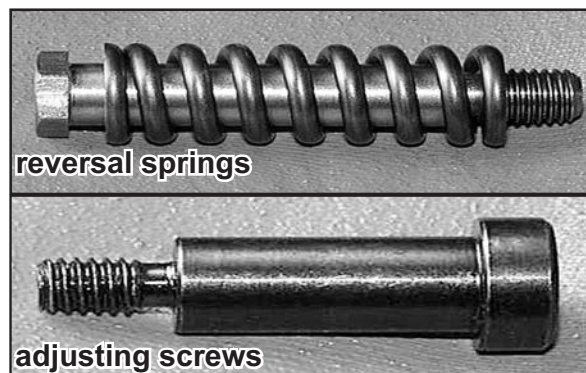
Use only new screws pre-treated with Drilock locking adhesive. Threads must be cleaned from oil. Degrease only non pre-treated threads.



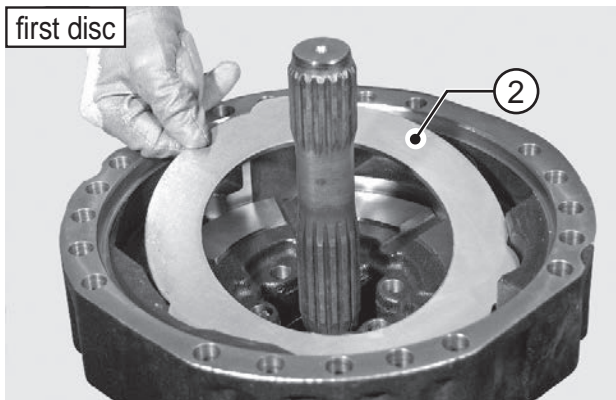
**FIGURE 15:** Fit the adjusting screws (5). Torque wrench setting: 5 - 7 N·m.

### CAUTION

Use only new screws pre-treated with Drilock locking adhesive. Threads must be cleaned from oil. Degrease only non pre-treated threads.



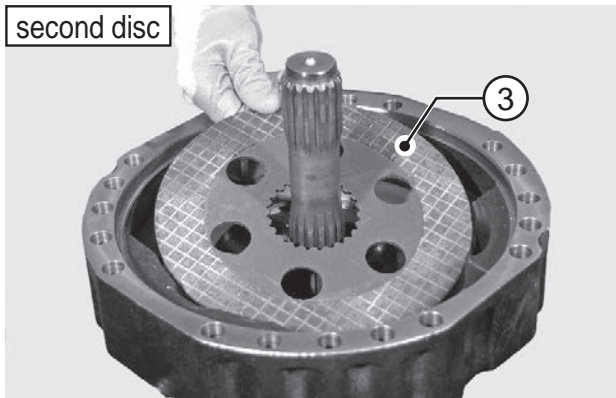
# ASSEMBLY



**FIGURE 16:** Insert the brake discs in the correct sequence.

**NOTE:**

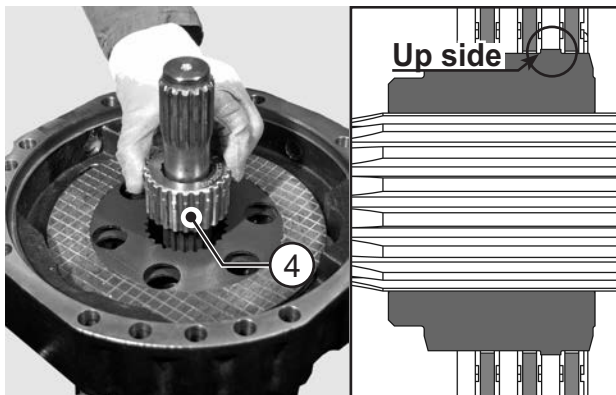
The first brake disc (2) to be inserted must be of metal material.



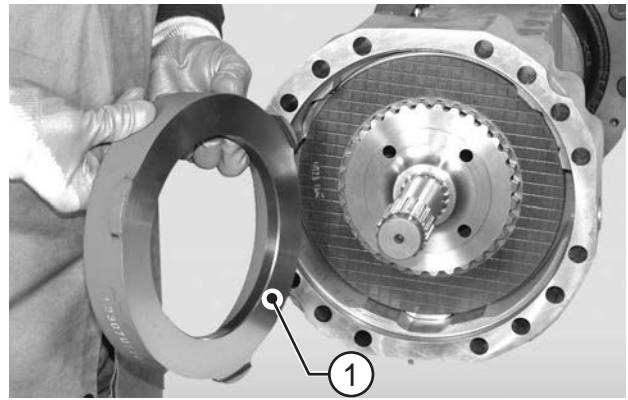
**FIGURE 17:** The second brake disc (3) to be inserted must be of friction material.

**NOTE:**

The last brake disc to be inserted must be of friction material.



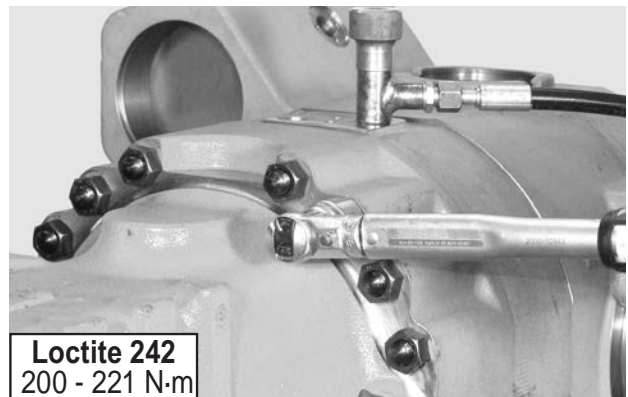
**FIGURE 18:** Install the flange (4) on the arm.



**FIGURE 19:** Insert the intermediate disk (1).



**FIGURE 20:** Check condition and position of the cylinder's o-ring.



**FIGURE 21:** Cross tighten the nuts in two stages.  
Torque wrench setting: 200 - 221 N·m



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